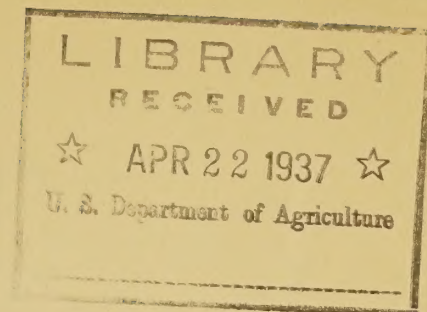


Adm. No. 51.

1.42
W52A



UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL ADJUSTMENT ADMINISTRATION
WESTERN DIVISION
WASHINGTON, D. C.

GENERAL INSTRUCTIONS

TO

RANGE INSPECTORS

PREPARATION OF REIMBURSEMENT CLAIMS FOR EXPENSES
INCURRED WHILE IN TRAVEL STATUS ON OFFICIAL BUSINESS

PREPARATION OF STANDARD FORMS 1012 AND 1012a,
PUBLIC VOUCHER FOR REIMBURSEMENT OF TRAVEL
AND OTHER EXPENSES, INCLUDING PER-DIEM

Any employee holding a per-diem appointment under a Letter of Authorization who is required to perform travel on official business will be issued a sub-Letter of Authorization direct from the Washington Office of the Western Division, and should prepare Reimbursement Vouchers (Standard Forms 1012, one original, and 1012a, two carbons) in accordance with the following instructions:

Under "Appropriation" enter "126/72215(21)1-0711, Conservation and use of Agricultural Land Resources, Department of Agriculture, 1936-1937, Agricultural Adjustment Administration."

On the line marked "Payee" the employee claiming reimbursement should enter his name exactly as it is given in the Letter of Authorization.

On the line marked "Address" enter the complete address to which the check in payment of the claim should be sent.

After "Official Headquarters" enter the place designated by the Letter of Authorization as the employee's Official Station.

Dates of beginning and ending of travel covered by the voucher, the number and date of the Letter of Authorization, and the total amount of the voucher, should be entered in the places provided therefor on the face of the voucher.

Travel accounts should be submitted for the calendar month,

unless the employee is not at his Official Station on the first or last day of the month. When the employee is not at his Official Station on the first or last day of the month, the period covered by the account should begin with the first day of the month on which the employee leaves his Official Station on official business and end with the last day of the month or the first day of the following month on which he returns to his Official Station. The payee should sign Form 1012, with ink or indelible pencil, in the space following the word "Payee," with his signature followed by his official title. This signature should be an exact duplicate of the name and initials indicated in the Letter of Authorization.

The account must be affirmed before a Notary Public, making sure that the notarial seal is placed on the face of the voucher, or it may be certified to by a postmaster, assistant postmaster, or acting postmaster, who will place the cancellation stamp on the voucher in lieu of the notary seal. The jurat must be complete as to date, name of town or city in which administered, and the signature and title of the person administering the oath. Any alterations or erasures in the jurat must be initialed in ink or indelible pencil by the person administering the oath.

If, for some reason, it is not feasible for the voucher to cover a complete trip beginning and ending at the traveler's Official Station, fill in Items 1 and 2, or 3, whichever applies, in "Itemized Schedule of Travel and Other Expenses," at the top of the body of the voucher. (See Paragraph 48 (a), "Government Travel Regulations.")

The initials of the claimant's immediate supervisor should be placed to the left of the space provided for the signature of the "Immediate Supervising Official." Also the Regional Director of the Forest Service or his authorized agent should indicate his approval by signing in this space.

Under "Character of Expenditure," the employee should start his account by stating the place, and the date and time of departure from his Official Station on the first day of the period covered by his reimbursement voucher, and then itemize his expenses according to dates. (See Paragraph 48, "Government Travel Regulations.")

Give the date and the time of arrival at, and departure from, every point visited, unless such date and time are itemized in the "Statement of Travel by Motor Vehicle" (Standard Form 1012e).

Taxi fare may be claimed only to and from common-carrier station to hotel or home, or to and from common-carrier station to place where official business is transacted. (See Paragraph 8 (a) "Government Travel Regulations.")

If claim for reimbursement for checking baggage is made, the number of pieces checked must be shown.

For local phone calls, the number of calls, and the rate per call, and the fact that the call was made on official business, must be indicated. (See Paragraphs 69, 80(a), and 81(e), "Government Travel Regulations.")

For long-distance phone calls, the name of the party, the place called, the time consumed by the call, and the fact that the call was

on official business, must be shown. In making long-distance calls the employee should be careful to instruct the operator that the call is on "Official Government Business" and that no charge should be made for Federal tax.

For any long-distance call the cost of which is one dollar (\$1.00) or more, a receipt must be obtained, and for any toll call the charge for which is more than 50 cents, Form AD-102, Toll Call Certificate, must be completed. If the call was made from a public pay telephone and a receipt could not be secured, the claimant must state on the voucher "Call made from public pay telephone."

In sending a telegram, a copy, with the amount charged shown thereon, must accompany the voucher. This copy of the telegram must bear the date and the stamp of the company transmitting the telegram. All telegrams must be sent at Government rate, and this rate, which is 40 percent of the commercial rate, must be insisted upon. (See Paragraph 56, "Government Travel Regulations.")

A claim for reimbursement for any cash expenditure of \$1.00 or more must be supported by a receipt. This receipt must be signed by an officer of the firm, with the firm name and his name and title.

If cash fare is paid on train or bus, receipts must be obtained and submitted with the voucher, and an explanation given why Government Transportation Requests were not used. (See Paragraph 20, "Government Travel Regulations.")

Where Government Transportation Requests are used, the duplicate copies of such Requests must accompany the voucher for all travel performed which is covered by that voucher.

When private automobile is used, the mileage covered daily should be shown on Standard Form 1012e. Mileage must not be claimed within the corporate limits of the traveler's Official Station. Reimbursement can not be allowed unless the automobile is owned solely by the traveler.

The means of transportation between each and every point visited must be itemized in the voucher, either on Standard Form 1012 or Standard Form 1012e. If any transportation is gratis, the itemization must clearly state that: "Travel was accomplished at no additional expense to the U. S. Government."

Per-diem in lieu of subsistence is figured on a one-quarter-of-a-day basis. The division in time is from 12 midnight to 6 A.M.; from 6 A.M. to 12 noon; from 12 noon to 6 P.M.; from 6 P.M. to 12 midnight. Any fraction of any of the above quarter-day periods will be considered as a quarter of a day, except that no per-diem will be allowed for a period of less than 24 hours. Per-diem may begin during any quarter-of-a-day period. Care must be exercised in making out accounts. Writing should be plain, and no erasures or corrections may be made unless they are initialed by the payee with ink or indelible pencil. Accounts must be approved by the Regional Director of the Forest Service or his authorized agent.

NOTE: It will also be necessary to submit Form AAA-338 or AAU-9 in triplicate, in cases where a comparative statement of cost is required.

Reimbursement for use of personally-owned automobiles is allowed when a showing is made in the reimbursement voucher of the comparative cost between travel by personally-owned automobile and common carrier

or other mode of transportation. In the preparation of the "Comparative Statement of Cost of Travel by Personal Automobile and by Railroad or Other Common Carrier" (Form AAA-338 or AAU-9), the following points should be taken into consideration:

(1) Cost by common carrier: Round-trip fare by railroad or other means of public transportation, plus Pullman if used, and per-diem in lieu of subsistence while in travel status.

(2) The mileage beginning and ending at the corporate limits of the Official Station, at the authorized rate, plus per-diem in lieu of subsistence while in travel status.

The amount under (2) can not be approved if it is in excess of the amount in (1).

Where travel is of a rural nature, or where common carrier is not available, it will not be necessary to submit Form AAA-338 or AAU-9, Statement of Comparative Cost.

In such instances, the fact that the travel was of a rural nature must be clearly stated on the reimbursement voucher; and the Statement of Travel by Motor Vehicle (Form 1012e) must show the places or points of travel, especially the points, such as farms or ranches which are not accessible by common carrier, together with the number of miles and the mileage rate and the total mileage claimed. Time of arrival at and departure from all points visited should be shown.

A memorandum from the Acting Director of Finance of the U. S. Department of Agriculture dated April 16, 1936, quoting a decision of

the Comptroller General of the United States with reference to the necessity for speedometer readings in connection with all automobile travel, requires that all claims for reimbursement for mileage must be supported by speedometer readings.

PREPARATION OF STANDARD FORM NO. 1012e,
STATEMENT OF TRAVEL BY MOTOR VEHICLE.

Standard Form 1012e should be submitted in triplicate. On the line marked "Name of Traveler" the traveler's name should be entered exactly as it appears on the face of Standard Form No. 1012. "Western Division" should be entered on the line marked "Bureau or Office." The type of vehicle, whether automobile or motorcycle, should be entered on the next line, followed by the place (name of city or town) said vehicle is registered, the registration number, and the owner's name exactly as it appears on the Letter of Authorization. On the next line should be entered the number and date of the Letter of Authorization under which the travel is performed. In the line "Period from _____ to _____" should be entered the dates (month, day, and year) which include all travel covered by the voucher. These dates should be the same as those on the face of Standard Form No. 1012.

In the column headed "Date" should be entered the date or dates on which each individual trip was made.

Under the word "From" and under the word "To" the names of the towns, villages, farms, or ranches visited, should be entered.

A traveler's home may not actually be located in the town designated as his Official Station. He must place himself in his Official Station at no cost to the U. S. Government. However, if the starting

point of his travel is between his Official Station and the place he is going to, he may claim the actual mileage traveled, if such mileage is not more than the mileage between his Official Station and the said place.

The other columns should be completed to show the hour of departure from, and the hour of arrival at, each point visited, together with the speedometer readings at the beginning and ending of each trip, the number of miles traveled, the rate per mile, and the amount claimed for each trip.

If the Official Station is an incorporated city or town, only mileage outside the corporate limits may be claimed.

If travel is performed by personally-owned motor vehicle between points served by common carrier, and no rural stops are made enroute for transaction of official Government business, Form AAA-338 or AAU-9 must be prepared and be submitted with the expense account in the same manner as outlined on pages 5 & 6. All of the information called for on this form must be submitted.

Each page of Standard Form No. 1012e, Form AAA-338, or Form AAU-9 must be signed (by the payee) in the space indicated at the bottom of the page, exactly as Standard Form No. 1012 is signed.

Following is a list of specific information which must be given in the preparation of travel claims if applicable to the travel for which reimbursement is being claimed.

Face of Voucher:

1. Type name in full - "John W. Doe" or "J. William Doe."

2. Give complete address to which check is to be mailed.
3. Give name of town or city and State that is designated in Letter of Authorization as Official Station.
4. The period of the voucher must include the dates of all original claims appearing therein.
5. Show clearly the serial number of the Letter or Letters of Authorization under which the travel is performed.
6. Sign, with pen or indelible pencil, (use name as typed at top of page) in space designated -

"SIGN ORIGINAL
ONLY"

(John W. Doe)

Payee (J. William Doe) Title _____

7. Have jurat administered before a Postmaster, Deputy Collector of Internal Revenue, or Notary Public, who must affix impression of seal if required by State law.
8. The jurat must be complete as to date, name of town or city in which administered, the signature of the person administering oath and title.

Itemized Schedule of Travel and Other Expenses:

1. When away from Official Station at the beginning of business on the first day of voucher period, give date of arrival at the last-mentioned place of duty shown by the previous voucher.
2. When away from Official Station on the last day of voucher period, show the approximate date of return thereto subsequent to the last day of the voucher.

Character of Expenditure:

1. The date and exact hour of departure from and return to Official Station, as well as arrival at and departure from

other points, must be shown.

2. When claiming per-diem, the actual dates should be stated.
For example: (March 1, at 2:30 p.m., to March 16, at 10:30 a.m. - 15 days @ \$____), or (On official duty Washington, D. C., March 1, to 31, 1937 - 31 days @ \$____)
3. When leave of absence is taken while in a travel status, give date and exact time of departure from and return to duty status.
4. If travel is interrupted by the taking of leave, only the per-diem which would have been incurred if the travel had been direct, should be claimed. This also applies to travel by an indirect route.
5. Telephone calls --

Local calls must be supported by a statement showing the number of calls, rate per call, and that the calls were on official business.

Long-distance calls must be supported by a statement showing the name of the person communicated with, the points between which service was rendered, the date, time occupied, the amount paid on each call, and that the call was made on official business. If the charge is in excess of \$1.00, a receipt is required, unless an automatic station was used and it is so stated in the voucher.

Form AD-102 is required for all calls in excess of 50 cents. This form is in addition to the above-

listed requirements.

6. Attach copies of telegrams to voucher, unless transmitted from Official Station, in which case the original messages bearing transmission marks are required.
7. Receipts must be submitted in support of any item of miscellaneous emergency expenditure, where the amount involved is in excess of \$1.00. These receipts must bear the name of the payee. Railroad fare is excepted, but fare for any Pullman accommodation is not.
8. The method of transportation must, invariably, be shown. In the event travel was at no cost to the Government, that fact must be clearly shown.
9. Explain the necessity for paying cash fare for transportation when the amount involved is \$1.00 or more.
10. Automobile --

Form 1012e must be completed to definitely indicate the ownership, to show in whose name the automobile is registered, and to give the speedometer readings. Form AAA-338 or AAU-9 must be submitted for all automobile travel authorized on a comparative-cost basis, unless rural travel was performed and that fact is clearly shown in the account. (For example: "Visited 20 farms or made intermediate stops for which common carrier could not be used").

Memorandum of Travel Performed Upon Transportation Requests:
(Form 1012)

1. Transportation requests should be listed according to serial number. This number appears in red figures in the upper righthand corner of the transportation request.
2. Unused portions of tickets procured during the voucher period should be returned with voucher unless they are to be used at a later date and that fact is clearly shown on the voucher. Expired return tickets may be retained for future use, provided the time limit can be extended at a saving to the Government.
3. The memorandum copy of each transportation request issued must accompany the voucher on which it is listed. In the event transportation requests are voided or ruined, both the original and memorandum must accompany the voucher.
4. If travel is performed on tickets procured with transportation requests scheduled on a previous voucher, this information should be given.

NOTE: Alterations or erasures must be initialed by the payee, except changes made in the jurat, which must be initialed by the person administering the oath.

George E. Farrell

George E. Farrell,
Director, Western Division.

April 1, 1937.

Public Voucher for Reimbursement of Travel and Other Expenses
Including Per Diem

Voucher No. _____
No. _____

(Statement of account must be completely filled in by payee prior to signature, and there must not be any erasure or alteration unless initialed or signed by him)

GENERAL ACCOUNTING OFFICE
PREAUDIT
Certified for payment in the
sum of \$ _____
R. N. ELLIOTT,
Acting Comptroller General of
the United States.
By _____

U. S. _____
(Department, Bureau, or Establishment)
Appropriation: _____
THE UNITED STATES, Dr.,
To _____
(Payee)

(Address)

PAID BY

(For use of Paying Office)

Official Headquarters _____ Domicile _____ Residence _____
(For use of the Postal Service only)

FOR REIMBURSEMENT of travel and other expenses incurred in the discharge of official duty		AMOUNT		NOTATIONS
		Dollars	Cents	(Payee must not use this column)
from _____, 19____, to _____, 19____,				
as per itemized statement within, under authority No. _____, dated _____, \$				
(Additional statements by Department, Bureau, or Establishment, if deemed necessary)	(ACCOUNTING CLASSIFICATION)	(Payee will NOT use this space)		
		Differences _____		

Account verified; correct for _____ \$				
		(Signature or initials) _____		

I do solemnly swear (or affirm) that the above account and schedule annexed are just and true in all respects; that the distances for which charge is made have been actually and necessarily traveled on the dates specified; that except as shown no lodgings were shared jointly with others nor were meals or lodgings furnished without charge by a Government agency or with or without charge by a member of my family, by another Government employee or a member of his family; that the amounts as charged, other than for allowance in lieu of transportation in kind and/or for per diem in lieu of subsistence, have been actually paid by me for travel and expenses incurred on official business only; that no part of the account has been paid by the United States, but the full amount is justly due; that all expenditures included in said account were made under prior authority therefor or under such circumstances as to render the securing of prior authority impracticable; that it was not, for reasons stated hereon, feasible to have payments made by a disbursing officer of the United States for the expenditures other than my own personal travel expenses; that the expenses for which no vouchers were obtained were incurred under such circumstances as to render the taking of vouchers impracticable, as fully explained herein; and that none of the car or other fares claimed, except as herein otherwise explained, was for travel between place of temporary residence or where meals were taken and place of duty.

SIGN ORIGINAL
ONLY

Payee _____ Title _____

(To be used at discretion of Department, Bureau, or Establishment)
Recommended for approval:

Subscribed and sworn to (or affirmed) before me at _____
this _____ day of _____, 19____

Signature _____
(Immediate Supervising Official)

Title _____

I certify that the official headquarters, domicile, or residence of the claimant is as stated above; that the travel was authorized from and to the points stated in the account, and for the period and at the subsistence rate or rates claimed, as shown by the authority on file, or (if such authority was not issued in advance of travel) as satisfactorily explained and approved hereon as required by the Standardized Government Travel Regulations; that the within itemized statement has been examined and is certified correct, except as noted; and that the amounts therein claimed are just and reasonable, except as noted.

* Approved for \$ _____

SIGN ORIGINAL ONLY

* _____

Title _____

Paid by { Check No. _____, dated _____, 19____, for \$ _____ } on Treasurer of the United States
{ Cash, \$ _____, on _____, 19____ } in favor of payee named above
Signature of payee _____

OBSERVE INSTRUCTIONS ON LAST PAGE OF THIS FORM

SIGN ORIGINAL ONLY

* If the ability to certify and authority to approve are combined in one person, one signature only is necessary; otherwise the approving officer will sign in the blank space below "Approved for \$ _____" and over his official title.

ITEMIZED SCHEDULE OF TRAVEL AND OTHER EXPENSES

1. Give duty status on first day of voucher period:

* Arrived at _____ on _____, 19____

for temporary duty for approximate period

Approximate date of return to official headquarters _____, 19____

2. State authorized allowance for per diem in lieu of subsistence: \$-----†

3. State authorized allowance for actual subsistence expenses: Not to exceed \$_____† per day.

* If authority provides for travel to more than one point, time of arrival and departure from each should be stated in the body of the account in chronological order.

† If more than one rate of allowance is authorized, full statement of application of each rate must be given in some convenient place on this voucher.

[illegible]

10-1684a

(To be used at discretion of Department, Bureau, or Establishment)

[illegible]

GENERAL INSTRUCTIONS

1. This form of voucher will be used in accounting for expenses of travel, including per diem in lieu of subsistence when authorized, and other authorized expenses for which reimbursement is claimed. Where an account is too large to be stated on this form use continuation sheets, and fasten them together in the upper left-hand corner. Fill in the form on this voucher, showing how transportation requests were used. Accounts must embrace each and every item of expenditure pertaining to the period for which the account is rendered.

2. Each account must be sworn to (or affirmed) by the person rendering it, in the form prescribed on the face of this form. Officers and employees traveling upon official business will be allowed their travel expenses, as explained and embraced in the travel regulations. The provisions of these regulations must be strictly observed in order to avoid suspensions and disallowances in the settlement of accounts.

3. One or more copies of the approved memorandum voucher may be used as required for administrative purposes.

Public Voucher for Reimbursement of Travel and Other Expenses
Including Per Diem

Voucher No. _____
No. _____

GENERAL ACCOUNTING OFFICE
PREAUDIT
Certified for payment in the
sum of \$ _____
R. N. ELLIOTT,
Acting Comptroller General of
the United States.
By _____

U. S. _____
(Department, Bureau, or Establishment)
Appropriation: _____
THE UNITED STATES, Dr.,
To _____
(Payee)

(Address)

PAID BY

(For use of Paying Office)

Official Headquarters _____ Domicile _____ Residence _____
(For use of the Postal Service only)

FOR REIMBURSEMENT of travel and other expenses incurred in the discharge of official duty
from _____, 19____, to _____, 19____,
as per itemized statement within, under authority No. _____, dated _____, \$

AMOUNT		NOTATIONS (Payee must not use this column)
Dollars	Cents	

(Additional statements by Department, Bureau, or Establishment, if deemed necessary)	(ACCOUNTING CLASSIFICATION)	(Payee will NOT use this space)			
		Differences _____			

		Account verified; correct for _____ \$			
		(Signature or initials) _____			

MEMORANDUM

Paid by { Check No. _____, dated _____, 19____, for \$ _____ { on Treasurer of the United States
in favor of payee named above
Cash, \$ _____, on _____, 19____

MEMORANDUM—DO NOT SIGN
10—1064a

WEH087404X-10 MEL 2:00

07 _____, 19

* Arrived at _____ on _____, 19____

for temporary duty for approximate period

Approximate date of return to official headquarters _____, 19____

2. State authorized allowance for per diem in lieu of subsistence: \$-----†

3. State authorized allowance for actual subsistence expenses: Not to exceed \$_____† per day.

* If authority provides for travel to more than one point, time of arrival and departure from each should be stated in the body of the account in chronological order.

† If more than one rate of allowance is authorized, full statement of application of each rate must be given in some convenient place on this voucher.

[illegible]

[illegible]

(To be used at discretion of Department, Bureau, or Establishment)

GOVERNMENT PRINTING OFFICE

U. S. DEPARTMENT OF AGRICULTURE

Toll Call Certificate

(For all toll calls exceeding 50¢)

Bureau

Division

Name of person making call

Name of person called

Call made from
(City)Call made to
(City)

Date of call

Number of minutes

Charge: Initial Additional

Total

Check type of call: ☐ Messenger ☐ Person-to-person
☐ Report charge ☐ Station-to-station ☐ Other

I CERTIFY that the long-distance telephone call described above was necessary on account of official business and was not personal.

.....
(Name).....
(Date)

APPROVED:

.....
(Name).....
(Title).....
(Date)

COMPARATIVE STATEMENT OF COST OF TRAVEL BY PERSONAL AUTOMOBILE AND BY RAILROAD OR OTHER COMMON CARRIER

(See paragraphs 8, 12, 12-a, and 83-e, Government Travel Regulations)

_____, 193__

**THIS FORM NEED NOT BE USED FOR TRAVEL TO RURAL OR OTHER POINTS INACCESSIBLE TO
COMMON CARRIER ***

RAILROAD OR OTHER COMMON CARRIER:

Would have left _____ at _____, 193__
And arrived at _____ at _____, 193__
Would have left _____ at _____, 193__
And arrived at _____ at _____, 193__
Would have left _____ at _____, 193__
And arrived at _____ at _____, 193__
Would have left _____ at _____, 193__
And arrived at _____ at _____, 193__
Fare.—One way or round trip depending on trip _____ \$ _____
Sleeping car, berth or Pullman seat _____
Per diem allowance, _____ days @ \$ _____, per diem _____
TOTAL _____ \$ _____

PERSONAL AUTOMOBILE (as actually incurred):

Place	Time	Date	Miles
Left _____	at _____ m.,	_____, 193__	_____
Arrived _____	at _____ m.,	_____, 193__	_____
Left _____	at _____ m.,	_____, 193__	_____
Arrived _____	at _____ m.,	_____, 193__	_____
Left _____	at _____ m.,	_____, 193__	_____
Arrived _____	at _____ m.,	_____, 193__	_____
Left _____	at _____ m.,	_____, 193__	_____
Arrived _____	at _____ m.,	_____, 193__	_____
Total automobile mileage, _____ miles @ 5¢ _____ \$ _____			
Per diem allowance, _____ days @ \$ _____ per diem _____			
TOTAL _____ \$ _____			
Savings and/or increased costs due to use of automobile _____ \$ _____			

* Where the entire automobile travel, or portion thereof, is to rural or other points inaccessible to common carrier, the points of travel, number of miles, make of car, the following two certifications, and a definite statement setting forth the fact that the places visited were to farms, ranches, or other definite places inaccessible to common carrier, must be clearly and fully shown in the voucher.

I HEREBY CERTIFY that none of the mileage claimed was within the corporate limits of my official station.

I HEREBY CERTIFY that the automobile used for the foregoing travel was my personally owned _____
_____ automobile.
(Make)

(Signature)

(Submit in duplicate with expense account)

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Adjustment Administration

COMPARATIVE STATEMENT OF COST OF TRAVEL BY PERSONAL AUTOMOBILE
AND BY RAILROAD OR OTHER COMMON CARRIER. _____, 193____

(See paragraphs 8, 12, 12-a and 83-e, Government Travel Regulations).

THIS FORM NEED NOT BE USED FOR TRAVEL TO RURAL OR OTHER POINTS
INACCESSIBLE TO COMMON CARRIER (*)

RAILROAD OR OTHER COMMON CARRIER.

Would have left _____	at _____	_____	193_____
And arrived at _____	at _____	_____	193_____
Would have left _____	at _____	_____	193_____
And arrived at _____	at _____	_____	193_____
Would have left _____	at _____	_____	193_____
And arrived at _____	at _____	_____	193_____
Would have left _____	at _____	_____	193_____
And arrived at _____	at _____	_____	193_____

Fare - One-way or Round trip depending on trip.....\$
 Sleeping car, berth or pullman seat.....\$
 Per diem allowance, _____ days @ \$_____, per diem.....\$
 \$.....\$

PERSONAL AUTOMOBILE (As actually incurred):

	Place	Time	Date	Miles
Left _____	at _____	M., _____	193_____	_____
Arrived _____	at _____	M., _____	193_____	_____
Left _____	at _____	M., _____	193_____	_____
Arrived _____	at _____	M., _____	193_____	_____
Left _____	at _____	M., _____	193_____	_____
Arrived _____	at _____	M., _____	193_____	_____
Left _____	at _____	M., _____	193_____	_____
Arrived _____	at _____	M., _____	193_____	_____

Total Automobile mileage, _____ Miles @ 5¢.....\$
 Per diem allowance, _____ days @ \$_____ per diem.....\$
 Total.....\$
 Savings and/or increased costs due to use of automobile.....\$

(*) Where the entire automobile travel, or portion thereof, is to rural or other points inaccessible to common carrier, the points of travel, number of miles, make of car, the following two certifications, and a definite statement setting forth the fact that the places visited were to farms, ranches, or other definite places inaccessible to common carrier, must be clearly and fully shown in the voucher.

I hereby certify that none of the mileage claimed was within the corporate limits of my official station.

I hereby certify that the automobile used for the foregoing travel was my personally-owned _____ automobile.

(Make)

(Signature)

(Submit in duplicate with expense account)

(Submit in duplicate with reimbursement account)

(Name of traveler)

(Department or Establishment)

(Bureau or Office)

Statement of travel accomplished with _____ registered at _____
(Automobile or motorcycle)

(Automobile or motorcycle)

(Place)

(Registration number)

(Name of owner)

and operated under letter of authorization number _____ dated _____

Period from _____ to _____

[illegible]

I hereby certify that the travel indicated above was officially necessary; that the information given is correct; that no part of the travel for which compensation is claimed was performed within the corporate limits of my official station.

JUL 10 1937

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Exp. 2

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL ADJUSTMENT ADMINISTRATION
WESTERN DIVISION

1937 Agricultural Conservation Program

Western Region

MAPPING PROCEDURE
AND ACREAGE DETERMINATION
GROUND METHOD

ISSUED APRIL 1937



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1937

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FOREWORD

The Western Division of the Agricultural Adjustment Administration embraces 13 States, therefore, any program of mapping the participating farms in this large area represents a unique problem. Due to the variety of farming methods in use over the area, the different types of terrain, and the necessity for rapid and economical accomplishment of the mapping work, it appears impractical to attempt to define a uniform, rigid line of procedure to follow throughout the region. Results, however, should be uniform and must be reliable to the standard of accuracy established.

The mapping work throughout the region will be accomplished by either the aerial-photographic method or by the ground method.

This circular attempts to set out, in detail, organization (regional, State, and county) and procedure for carrying out the project for mapping by ground surveys areas in the Western Region participating, now and in the future, in agricultural conservation programs. The State organization outlined herein would appear to be practical for each State in the Western Region, varying only to the extent of the number of district engineers required. The county organization as developed herein may be considered an ideal one for the larger counties in which the participating area is made up of a large number of farms and represents a fair proportion of the total area in the county. On the other hand, the extent of participation in certain counties will not justify the extensive set-up as outlined.

With this in mind State forces are authorized to modify the plan of organization for any county, so as to provide the most economical type of organization, consistent with efficient operation. It should be understood, also, that in some counties the set-up may be considered as functional, rather than organizational. For instance, it might be advisable to employ an individual as county supervisor, but on the contrary, in the smaller counties some official of the association, such as the secretary, must assume the responsibility for over-all supervision of the mapping project. If a field captain, as such, is not feasible in certain of the counties, one of the better farm supervisors may keep a watchful eye over others operating in nearby territory.

The procedure as outlined here, is considered an ideal set-up, and as such may be modified to suit local conditions. In any modification, however, the goal of a complete, accurate map should always be in mind, as well as the desirability of uniform records and results. The traverse board and steel tape is recommended, but this does not mean that other accepted surveying equipment and methods may not be adopted for a county if for good and sufficient reason the recommendations contained herein are not practical. Any modification of procedure must have the prior approval of the State engineer, who, when in doubt of the advisability of such modification, will take the

matter up with the regional director for advice. Many counties have measuring equipment, such as A-frames, bicycle wheels, and other types of wheels, which are entirely practical for measuring if used properly. It is not believed that these counties should junk such equipment in favor of the steel tape, but that the use of this other equipment may be continued, with proper steps taken to assure its accurate use.

STEPS IN SURVEYING AND MAPPING WORK

1. Plane table surveys of areas on legal subdivision basis without respect to property lines or ownership will be made. The map will be placed on paper 16 by 21 inches, and all natural and permanent features, such as fences, streams, irrigation ditches, etc., are to be shown. If the survey is made at the time when performance can be determined, then performance features are also shown. The paper on which the farm supervisor will draw the map of the area originally will be furnished by the Western Division, so as to assure uniformity. This map as drawn originally by the farm supervisor, is spoken of in this circular as the "field sheet."

2. A base map will be traced from the field sheet on 16- by 21-inch semitransparent map form, and on this base map, only the natural and permanent features of the area are to be traced.

3. The information to determine extent of performance with requirements of the 1937 agricultural conservation program may be obtained from the field sheet if the field sheet is developed at the time when such performance can be determined by the farm supervisor. If performance has not been determined at the time the field sheet was developed, a white print will be made of the tracing mentioned in paragraph 2, as indicated in paragraph 4, following.

4. The base map will be sent to a central laboratory to be established at Salt Lake City, where white prints will be made, whereupon the prints and the base maps are returned to the county.

5. In developing maps for individual farms, this may be done by cutting up the white prints to draw together on one large sheet the several fields which go to make up the farm. These portions of the white print may be pasted on a sheet carrying proper designations.

6. Prints of the base maps and maps for the individual farms will be made up for each succeeding year of the program. The farm supervisor operating in each township or particular subdivision of the county will take to the field with him the original field sheet, or sheets, for the area, and new white prints, and make such notations on the white print as may be necessary each year in order to determine the extent of performance under the requirements for that year on each field or individual farm.

MATERIALS

The Western Division will furnish to the county associations, through their respective State offices, paper of the necessary weight and quality for the field sheets and the base maps. The county associations will be expected to furnish all other equipment and supplies necessary for carrying out this project.

MAPPING PROCEDURE AND ACREAGE DETERMINATION

GROUND METHOD

1. ORGANIZATION

To provide for rapid and economical execution of the mapping project it is essential that field work on a large scale be initiated as early as possible.

This entails the employment, mainly by county agricultural conservation associations, of a large number of field men, draftsmen, computers, supervisors, etc. Many of these men will be unfamiliar with the work at hand. To simplify the training problem and to insure reliability in the finished maps, county and State units should avail themselves of the services of any experienced mappers now in their employ and a concerted effort should be made to reemploy those men who have proven their competence in similar work during the past 3 years.

For guidance in line of authority and responsibility a tentative organization chart is to be found in the appendix. This organization may be modified so as to meet best the requirements of the work in any county or State.

The duties and responsibilities of the various positions are outlined, in brief, below:

a. Engineer in Charge of Ground Surveys (*Washington*).—With rather wide latitude for unreviewed action or decision in technical matters, to coordinate and supervise the activities of the State and county surveying and mapping organizations; to advise with the regional director or assistant in matters of policy relative to surveying and mapping matters; to provide necessary instructions to mapping units relative to revisions or compromises in procedure; to initiate a system for inspection of field and office mapping that guarantees standards of accuracy; and to provide cost and progress records adequate to the economical and expeditious execution of the work.

b. Assistant to Engineer in Charge (*Washington*).—Responsible to the engineer in charge, to assist in the supervision and coordination of the surveying and mapping work; at times to conduct field inspections as representative of the engineer in charge; to assist in devising short cuts and improved technique in field and office procedure and to supervise the routine office work necessary in connection with the cost and progress records and coordination of the work.

c. State Engineer (*State Headquarters*).—To coordinate the mapping work of a given State, or, possibly in some instances of two

States; to assure uniformity and adherence to established standard in the mapping work of the State; to assist in selecting or employing competent district engineers and to organize and direct the activities of such inspectors in training, supervising, and inspecting the field crews; to provide for an adequate system of State cost and progress records; to advise with the district engineers and county supervisors relative to the mapping activities and to act as liaison officer between the State organizations and the regional office.

d. District Engineers.—To be directly responsible to the State engineer and to act as his representative in coordinating and supervising the surveying and mapping activities within the State or portion of the State as assigned to him by the State engineer; to assist in the training and organizing of the field crews; to assist in the assembling and maintenance of cost and progress records as may be required; to conduct physical checks of 1 percent or more of the farm surveys within his assigned area to assure adherence to standards, and to inspect county-mapping organizations, and to advise with the county supervisor relative to improvements in organization or methods.

e. County Supervisor.—

(1) To be responsible to the State engineer through the district engineer and to supervise and direct the surveying and mapping activities of his county.

(2) With the assistance of, and in accordance with, the plans of the State engineer, to organize, initiate, and execute the mapping program of the county.

(3) To recommend the scale to be adopted for the county on a basis of the average size farm.

(4) To be largely responsible for the selection, employment, and training of the county mapping organization.

(5) To assign definite areas to the field captains and adequate organizations and equipment for the execution of the work; to assure that adequate, well distributed check surveys are made by the field captains.

(6) To arrange with proper association officials for the procurement of equipment and supplies for field and office forces.

(7) To direct the activities of the drafting unit through the chief draftsman and to assure the reliability of the finished work.

(8) To report periodically as to cost and progress of the work.

f. Chief Draftsman.—To be responsible to the county supervisor and to train and direct the activities of the drafting organizations; to assure uniformity, reliability, and adherence to standards in the drafting and computing work and to indicate such responsibility to the supervisor by initialing farm tracings completed in accordance with the standards; to advise with the field captains relative to priority of field surveys, check surveys, or inadequate field data, and to assist in the maintenance of cost and progress records.

g. Field Captain.—To be responsible to the county supervisor and in general to assure the efficient, economical, and reliable execution of the field work within the area assigned; to be largely responsible for the training and operation of the field crews assigned to him, to make physical checks of field work by an adequate number of well-

distributed resurveys; through such check surveys and through constant contact with the field crews to evaluate the field units, and through the supervisor to arrange for the weeding out of incompetents, the recognition of outstanding men, and in general to increase the efficiency of the organization and the reliability and uniformity of the results; to advise with the supervisor and chief draftsman relative to priority of field work and to assist in the assembling of cost and progress records.

h. Farm Supervisor.—To be directly responsible to the field captain for the completeness and accuracy of the farm survey; to direct the activities of his assistants, to plan and execute the surveys assigned him; to operate the plane table and alidade and to assure that the required data are incorporated on the original farm map neatly, legibly, without omissions, and to the standards of accuracy established; to be responsible for the field equipment assigned him, and in general to be responsible for the efficient and expeditious accomplishment of the field work.

The farm supervisor must be diplomatic and tactful as well as efficient, as in a large degree he is responsible for the relations between the farmer or operator and the Agricultural Adjustment Administration, and it is essential to the success of this program that cordial and cooperative relations be maintained.

i. Chainman.—Under the direction of the farm supervisor, to make the field measurements by chaining, or by use of rod or range pole, or in such manner as the farm supervisor may direct; to be responsible, in the matter of chained measurements, for an accuracy which may be relied upon to within less than 1 percent of error; to properly care for the equipment assigned him, and in general to assist the farm supervisor in any way possible in the execution of the survey.

2. PURPOSE OF THE MAP

The field sheet, by the use of standard identification marks and appropriate symbols, should show all permanent and natural features which go to make a complete map, and which will be used in determining the extent of compliance with the requirements of the agricultural conservation program in any year. If, at the time of mapping, it is possible to determine compliance, the field sheet should show complete land usage, such as crops planted, stage and extent of growth, and any soil-building practices which are of importance in the program.

3. FEATURES WHICH SHOULD BE SHOWN

A. Permanent Features:

1. Fences bounding the farm and bounding fields.
2. Property lines and permanent field boundaries, even though not fenced.
3. All roads bounding the farm, as well as all lanes and roads crossing it.
4. Irrigation and drainage ditches, canals, and railroad tracks.
5. House lots, barnyards, feed lots.
6. Streams, lakes, and ponds.

7. Woodland, idle noncrop land, such as swamps, brush, stony or hilly land.
8. Major erosion damage, such as deep gullies, should be indicated.

B. Compliance Features:

9. Tree plantings made on crop land, orchards, and small fruit.
10. All erosion-control features, such as terraces, pasture terraces, soil-saving dams, check dams, contour listing, basin listings, strip cropping, etc.
11. Patches of noxious weeds.
12. All turn rows and fence rows.
13. The measurements of all fields must be shown with the crop for the year in question indicated.
14. Other features which are of sufficient importance to influence present payments under the terms of the agricultural conservation program should be indicated.

In the appendix will be found standard abbreviations and symbols for delineating features.

If a farm is completely fenced and cross-fenced, then the fences are probably the most permanent features and should therefore be shown on the base map. The actual area covered by crops each year may vary in position, but by reference measurements to fence lines the crop acreage can be determined. Accordingly as the cultivated area is pertinent to this program, in the event that the crop area is defined at the time of survey, the boundaries of the net crop coverage will be shown. This is important in that it affects payment, therefore the crop coverage will be determined by measuring in from the fence to the edge of the plowed land and writing in the name of the crop seeded.

4. STANDARDS

A tolerance of 1 percent has been established as the standard of accuracy to be maintained. In the event, therefore, that unit boundaries do not close within 1 percent of the perimeter distance in lineal measurement, or in degrees within one times the square root of the number of corners in the boundary, for angular measurement an error is indicated and sufficient rechecking will be made to isolate and correct the error.

In original field sheets as prepared by field supervisor no attempt will be made toward finished drafting. Field sheets should, however, be neat, legible, and conducive to easy and positive interpretation and tracing.

The finished base map traced from the field sheet will be an accurate, neat, and legible reproduction of the field sheet. It will be prepared in accordance with established procedure on the appropriate form for that purpose.

Within the limits of accuracy established, both field and office work must be reliable and such reliability can be assured by an adequate checking system.

5. ACCEPTING SURVEYS MADE BY OTHER ENGINEERS

In some cases farmers have employed county surveyors or other qualified engineers to make maps of their farms. The question will immediately arise as to whether these surveys should be accepted. In making a decision on this point the following things should be considered:

a. The plat and field notes of the engineer who made the survey should be obtained and studied to determine the method used.

b. If the survey of another engineer is accepted, however, the county supervisor is in no way relieved of the responsibility for accuracy within the limit established.

c. No survey may be accepted by a captain or farm supervisor without the approval of the supervisor.

d. In the event that a survey by another engineer is accepted, a tracing thereof must be secured and the farm must be visited by a competent field supervisor, at which time he will check the plat for completeness of data, indicate net crop areas, changes made in fields, and in general incorporate on the existing plat the compliance data required.

6. ACCEPTING SURVEYS SHOWN IN COUNTY PLAT BOOKS

In general, it is suggested that surveys as shown in county plat books will not serve in connection with the agricultural conservation program.

Acreages as recorded will not be indicative, in that in most instances waste land, unproductive lands, even roads and streams may be included.

It is suggested that such records be used merely for the purpose of determining the location of the farm and the approximate size and shape of the area to facilitate the mapping work.

7. EQUIPMENT

The policy of making complete and detailed farm maps for use in the agricultural conservation program presupposes a continued use of the map over a considerable period of time. The fact that a continued use is anticipated, together with the change in mapping policy, makes imperative the procurement of adequate surveying and mapping equipment.

It is strongly recommended, therefore, that professional instruments, manufactured by reliable concerns, be secured.

Recognized manufacturers list a complete traverse table outfit particularly suited to this work. While these outfits are listed at \$38 to \$41 complete, it is believed that in quantity they may be secured at approximately \$25 per set. On a basis of 1 year's work only, the cost of each outfit could be prorated over approximately 40 farms. This equipment is practically nonexpendable but by charging off 100 percent depreciation during the first year, each farm survey would represent an equipment investment of 62½

cents. The possibility of building adequate equipment locally at even less cost also should be considered. Drawings and specifications for such equipment are shown in the appendix.

A. FIELD

1. Equipment for Farm Supervisor:

- 1 traverse board not less than 18 inches by 24 inches equipped with a compass needle at least 3 inches in length set in a channel at or near the edge of the board.
 - 1 tripod, preferably stiff leg, equipped with a Johnson leveling head or equal, to provide for rapid leveling and orientation of the board.
 - 1 alidade, of brass, not less than 10½ inches in length, graduated 40 divisions to the inch on one edge over 10 inches of its length and equipped with folding sights not less than 4 inches in height, the rear of which should be of the open type, and the fore sight of the wire or crosshair type. A leather sheath or case for protection and carrying, when the instrument is not in use.
 - 1 notebook, for noting data pertinent to the survey prior to initiation of the work, and for information secured in the field not incorporated in the plat, such as time required, farmer's claims, etc.
 - 1 six-inch 30° by 60° celluloid triangle.
 - 1 engineers pocket scale 6 inches in length, graduated on one edge—40 divisions to each inch—and on the other—20 divisions to each inch.
- It is desirable that each party be equipped with a 50-foot cloth tape in a case.
- 1 pad of sandpaper pencil pointers.
 - A supply of pencils 3H and 5H.
 - A supply of scratch paper.
 - Erasers, thumb tacks, and scotch tape.
 - Letter-size envelopes for protecting case data.
 - A supply of plane-table sheets—For this purpose it is suggested that a tough semitransparent paper be used.

2. Rodmen and Chainmen Equipment:

- 1 engineers' steel tape 100 feet in length graduated in feet with the first and last foot graduated in tenths of a foot.
- 1 range pole, preferably sectional, at least 7 feet in length, equipped with a sharpened steel point. The range pole should be marked off in feet with alternate feet painted red and white.
- 11 chaining pins, made of heavy wire, sharpened, painted red to facilitate finding, and provided with a loop or circle on top to permit carrying on a key holder or belt clip.
- 1 six-ounce plumb bob and string.
- 1 package of suitable tape splices.
- 1 hand axe or boy's axe with a flat back suitable for driving stakes.
- A supply of lath for use as stakes to mark points on the ground desirable to retain for a short period.

A supply of keel or lumber crayon for use in marking stakes.

A notebook and pencils for noting pertinent data when too far from the instrument to be accurately observed or understood by the farm supervisor.

B. OFFICE

1. **Each Draftsman** (basis is one draftsman per five reporters) :

1 drafting table or drafting board not less than 18 inches by 24 inches in size.

1 twenty-four-inch T square or steel straight edge.

1 engineer's 12-inch boxwood scale, triangular with white edges, with full divided scales 10, 20, and 40 parts per inch.

1 five-inch diameter semicircular celluloid protractor graduated to $\frac{1}{2}^{\circ}$.

1 or more 10-inch 30° by 60° or 45° celluloid triangles.

1 box of thumb tacks.

1 ruby eraser.

1 sandpaper pencil pointer.

6 pencils, 4H

6 pencils, 2H.

6 HB pencils.

2. **Equipment and Supplies to be Available for Drafting Use:**

1 planimeter (for direct measurement of irregular areas).

A supply of scotch tape.

Shears.

Scratch paper.

Letter-size envelopes.

A supply of mapping forms of the various standard sizes.

8. SUGGESTIONS FOR HOME MANUFACTURE OF EQUIPMENT

In the event that a county association may consider it impracticable to purchase manufactured equipment, the following suggestions are made to facilitate equipping such association:

1. The alidade described under 7 A 1 (p. 6) will give the best results and should be secured when possible. However, a substitute may be prepared through the use of a flat chain scale 12 inches in length with celluloid edges, divided 20 and 40 parts to the inch, and attaching suitable sights either purchased or home-made. It is suggested that the shops of the engineering school may be of assistance in this connection. Also, a drawing of another type of home-made alidade will be found in the appendix.

2. It is feasible to manufacture locally a tripod which will serve the purpose quite satisfactorily. In the appendix will be found drawings and specifications for such a tripod.

3. Traverse table boards may be satisfactorily constructed by any capable carpenter. Unless other items of the outfit are to be constructed it is not believed that the saving realized on traverse table boards would justify their construction. However, the appendix contains a drawing and specifications for a traverse board.

In constructing traverse table boards white pine should be used if obtainable. The material should be $\frac{3}{4}$ inch in thickness and care should be taken to assure tight joints. The entire board should measure 18 inches by 24 inches which dimensions include a cross strip at least 2 inches in width, flush with the top of the board, transverse to the grain of the pine at each end of the board. Both surfaces of the board should be varnished to reduce the possibility of warping. At the midpoint of one edge a channel should be made into which should be set a 3 inch plane table type, compass needle, with the top of the vial flush with the surface of the board.

Five-ply laminated wallboard may be used by carefully squaring all edges and fitting a thin oak strip to each edge to prevent raveling and reduce warping.

4. Entirely satisfactory range poles may be constructed by fitting a metal point to any straight, round, or octagonal pole of sufficient length, marking into one foot sections and painting the sections alternately red and white. In place of wood, one-half-inch steel tubing may be used in which case the forged point should be threaded and screwed to the pole section.

5. Chainage pins may be made without difficulty. The pins should be made of 16-inch stock $\frac{3}{16}$ inch to $\frac{1}{4}$ inch in diameter. The stock should be of hard steel in order that the pins will not be easily bent. On one end a ring or loop approximately 1 inch in diameter should be formed, the other end should be sharpened to permit easy use in hard ground. The ring ends should be dipped in red paint or in lieu of red paint a strip of red cloth may be tied to the ring to facilitate finding the pins. In an emergency, chaining pins can be made of no. 6 galvanized wire. Eleven pins are required for each set.

9. OBJECTIVES OF FIELD CREWS

The field crews will be expected to furnish to the association office a complete map, drawn in accordance with the requirements laid down in this circular, of all areas assigned to them for this purpose. If the time of mapping coincides with the time for determining performance, then the field crews will indicate on the maps by symbol or otherwise all information necessary to show the extent of performance on all farms.

It will be largely the responsibility of the field crews to maintain cordial and cooperative relations between the farmer and the office of the county association. In this respect it will be necessary that tact and diplomacy be used at all times.

10. OBJECTIVES OF OFFICE ORGANIZATION

The county supervisor with the approval of the State engineer will select the scale to be used for the county. Departures from this scale are to be made only with the approval of the State engineer and such departures should be clearly indicated on the map.

It will be the duty of the office organization to prepare the base maps from the field sheets submitted by the field crews, to determine the acreages of the various component parts, and with the assistance

of an expert in the agricultural conservation program to classify the various crops and indicate the classification in the schedule on the map form and to properly file the various farm data.

Through the county supervisor, priority for the various surveys should be established, and prior to initiating the survey, the office organization should secure and assemble such available information as may facilitate or expedite the field work.

11. FIELD PROCEDURE

Generally speaking, maps will be developed along legal subdivision lines rather than on an individual farm basis. In other words, the legal subdivision or part thereof participating in the program will be mapped by field crews and base maps traced in the association office on the same basis. After the base map is drawn for all participating farm land, then it will be possible from year to year to build a map of the individual farm unit by taking from blue prints of base maps those portions of the legal subdivisions which go to make up the farm unit for the year.

In a county where a general land office survey has been made scales might be chosen so that each field sheet would contain a map of a section or quarter section, depending on the size of the fields within the section, regardless of ownership. In an area of very small farms, it might be well if the scale adopted provided for mapping only 40 acres on each field sheet. This paragraph indicates the use of three scales, but it should be borne in mind that each State (and county) should complete the mapping by the use of only one scale, if possible.

While the general rule is for mapping along legal subdivision lines, naturally the rule cannot apply in parts of the Western Region where there is no public survey along these lines. In such cases, the association will arbitrarily establish divisions of the area, corresponding to the legal subdivision idea, to provide units for mapping. The establishment of arbitrary divisions of areas for mapping purposes should be done logically by a set rule, following irrigation or drainage ditches, stream boundaries, or other permanent features, and once established should be adhered to and identified by symbols and numbers in such a way that the maps can be filed expeditiously, and located later for building individual farm maps.

Consideration having been given to the increase in difficulties and the probability that many rather complex surveys will be encountered in the mapping program, it has been decided that procedure should be standardized insofar as is practicable. This decision is predicated on the assumption that county units will be provided with standard or reliable equipment.

The traverse table and open sight alidade has been selected as the best means of assembling and delineating the field data. The cost of telescopic alidades prohibits the use of stadia; accordingly the 100-foot engineer's steel tape has been selected as the measuring medium.

a. General Suggestions.—1. The equipment necessary for a complete outfit having been assembled and checked, the field crew is ready for assignment.

2. Check to see that the assignments have been grouped in order, to avoid undue loss of time in travel.

3. Before starting for the field, make certain that the field crew has been provided by the county office with all necessary information relative to the areas to be mapped.

4. Contact the producer or producers operating on the legal subdivision immediately upon reaching the premises. It is desirable, if possible, to advise the producer in advance of the time the survey is to be made.

5. Ask the producer to accompany you on the survey. He will be keenly interested and can be very helpful in locating boundaries, etc.

b. Survey Operations.—1. Fasten a plane table field sheet firmly and smoothly to the board. Scotch tape is suggested for this purpose rather than thumbtacks or the thumbscrews ordinarily used for fastening heavy paper.

2. Set up the plane table at or near a corner of the unit, preferably on one end of a long side. Have a stake driven to temporarily mark the location of the selected point. This point for reference purposes should be designated number one.

3. Orient the board with the compass and estimate the approximate position the area to be mapped would assume on the sheet. If the line which has been selected as the base does not fall approximately parallel to the sheet edge or in an appropriate location, either shift the paper until this is possible or decide upon the use of the selected line regardless of orientation.

If it is practicable to truly orient the board, a simple north arrow parallel to the compass edge of the board should be drawn near the margin of the sheet.

In the event that this orientation is impossible, draw, in an appropriate location on the sheet, the line representing the line on the ground selected as the base. Indicate the position of the instrument by a light pin prick with a small circle around it for the initial point; unclamp the board and orient it by the compass needle; set the alidade parallel to the compass and sight on any distant object; unclamp the board and return it to the position in which the alidade sights are on the selected base line when the alidade is laid in position along the corresponding base line on the sheet. Then with the board clamped, line the alidade with the selected distant object and the initial point, and indicate the magnetic north by means of a line on the sheet. A parallel offset line may be drawn to avoid possibility of confusion in the event that the north line should fall across the map area. (*Whenever possible the board should be oriented to cardinal directions.*) Unclamp the board and return it to the position in which the alidade sights are on the selected base line when the alidade is laid along the corresponding base line on the sheet. When the board is oriented to the compass, this line may be drawn with the board clamped in true orientation.

4. Always ascertain that the board is clamped while sights are being taken or sketching is in progress.

5. While the field supervisor is orienting the board and preparing for the mapping work, certain additional details should be attended to at this time by the chaining crew. Stakes and a back-

sight made of lath suitable for sticking in the ground should be prepared; the tape should be unrolled and in readiness. When the selected beginning line falls along a road or lane, during the interim the chainmen should secure and note for the supervisor pertinent data, such as the width of road or lane, distance from instrument to adjacent fence lines, distance from fence lines to neat crop area, and any other desirable information.

6. The chainman should start measuring the selected beginning line. Chainmen should be instructed to chain as rapidly as is consistent with accuracy, and upon reaching the end of the line should mark the point with a stake, give the farm supervisor a sight on the point with the range pole, and then they should call the farm supervisor ahead.

7. While the chaining crew is measuring the first line the farm supervisor should scale and plot the data furnished him by the chaining crew.

8. Chaining crews should be trained to secure, during the measuring of a line, adequate ties to features encountered, such as the point of crossing of small streams, or the edges of waste land, or unfenced changes in crop, a point opposite a bridge on an adjacent road, cross fences, etc. It should be remembered that since the farm supervisor is responsible for the reliability of the assembled data, and since the plane table work is the most painstaking and, consequently, the slowest, the farm supervisor should never be obliged to wait upon the chaining crews. Efficient chaining crews will anticipate the needs of the farm supervisor and secure the desired measurements or information on their own initiative.

9. Having set up the traverse board over point no. 2, which has been designated by a marked stake, the farm supervisor should obtain the length of the first line from the chainman, together with such data as may have been secured en route. These notes may be kept on a convenient size scratch pad or note book, the sheet torn off and given to the farm supervisor, who should keep the accumulation of slips, even after plotting, until the unit map is complete.

10. The chaining crews should then proceed with the measurement of the second line as indicated by the farm supervisor.

The customary practice will be to first map the exterior boundaries of the unit together with adjacent pertinent data, after which interior mapping may be easily done. A further advantage of this practice is that a satisfactory closure will be obtained on the exteriors, thus reducing to a minimum the retracement or correction work necessary, in case of misclosure.

Accordingly, having provided the farm supervisor with the notes relative to features encountered along the previous line and adjacent to the instrument point in each case, the chaining crew should successively proceed with the measurement of the next course until the point of beginning has been reached.

11. Having leveled the board and assured himself of the stability of the instrument, the field supervisor should set the alidade along the line on the sheet representing the first line. He should then turn the board to a position that, when the board is clamped and the alidade in place along the initial line, the backsight or flag, set in

the ground at the initial point prior to leaving, can be seen in the alidade sight. The board is then oriented to the survey and plotting may continue.

The farm supervisor should carefully scale on the initial line the chained distance as reported by the chaining crew, mark the terminus by a light pin prick within a small circle, and designate the point with an appropriate number, in this case no. 2. The distance, reported in feet and other units of measurement, should always be indicated in this manner on the outside of the tract, wherever possible, to reduce the possibility of confusing other data. Extreme care should be taken in scaling distances. The intermediate data reported should then be plotted; the information secured adjacent to the second point and any further sketching that can be done adequately without additional measurement, should also be plotted, pending completion of measurement of the second line.

12. When the chaining crew has signaled its readiness, the farm supervisor, holding the rear end of the graduated edge of the alidade exactly alongside of point no. 2, should move the front of the alidade into position, so that the range pole of the chainman at point no. 3 falls within the sights of the instrument. Proficiency in this operation is achieved through experience. Plane table operators equip themselves with a pin or needle on the head of which has been attached a ball of sealing wax or a cork to facilitate handling. This pin is held firmly in the point representing the instrument station and serves as a pivot for the edge of the alidade. Having satisfied himself as to the accuracy of the alidade setting, the farm supervisor draws a fine line along the edge of the alidade and signals "OK" to the chainman.

If considerable plotting has been done at the set-up prior to taking the fore sight, before depending on the location of the forward tangent it will be well to check on the back sight, to make sure that the board has not slipped.

13. The farm supervisor should then move to point no. 3, where he will set up the board, obtain the supplemental data from the chaining crew, orient the board by back sight, with the alidade laid accurately along the line representing the second course, and then proceed with the plotting of the data secured.

14. This procedure will apply until the last corner is reached. From this point the farm supervisor will be able to see the flag at the point of beginning and determine the error of closure.

At this point the same procedure should be followed as though the initial point had not been plotted. Having then determined the direction of the last course, as shown by the alidade when sighting on the point of beginning with the board properly oriented, the reported distance is scaled on the resulting line and the error of closure measured.

15. In the event a closure error is evident, larger than the established limit, the following procedure should disclose the trouble: (a) Check the scaling of the individual courses against the lengths of the courses, as noted along the line, and against the notes furnished by the chainman. (b) Occupy any corner from which several corners are visible, orient the board to the back tangent, and sight on as many corners as may be in view, drawing very light lines across the sheet in order that the accuracy of the plotting to those

points may be observed. Usually this will isolate the section in error and may even indicate the cause, such as an error in chainage of 100 feet. To reduce retracement work it is suggested that this practice be followed during the original survey; when time permits, sight all visible, previously established points, with the board in orientation.

16. Usually the closure error will be found to be so small as to necessitate changing only one or two courses. In any event when a satisfactory closure has been obtained the closure error should be adjusted. No angle should be changed by more than one-half degree.

17. Having satisfactorily closed and adjusted the exterior boundaries of the tract the interior data must now be incorporated. Experience will rapidly increase the efficiency of the entire organization in this phase of the work.

Small fields or areas having been cut into generally rectangular or straight-sided fields will present few difficulties. Bear in mind that each point previously occupied and indicated on the field sheet is now an established position to which interior data may be tied. Unless isolated interior fields exist it may not be necessary to traverse the boundaries of the various fields, due to the fact that some of these data may be plotted on your sheet as a result of chaining-crew notes. The map should indicate the edges of the plow land on interior fields as well as along exterior boundaries. The chaining crews should be impressed with the importance of securing these necessary measurements. No effort should be made to run lines exactly in fence lines or in any place where visibility is impaired or progress of the work retarded. In such cases, with the board properly oriented and measurements taken to the fence or object affecting visibility, the position of such object can be sighted and plotted as accurately as though the instrument were in the fence row.

Sketches will be found in the appendix illustrating suggested methods for expediting the work. Every farm supervisor on becoming familiar with the use of the traverse table and alidade will devise methods for more rapid operation.

However, care should always be exercised in the following respects: The traverse board should never be jarred. A sight should never be taken or a line drawn on the sheet without being sure that the board is clamped and that the orientation has not been disturbed. No requisite information should be omitted from the field sheet. Lines should be fine and sharp and lettering clear and distinct.

18. After the interior data has been incorporated the field sheet should be checked to assure that nothing is omitted, that all features are shown by the appropriate symbol, that the neat lines of crop areas are properly delineated, that the sheet bears the State and county code and legal description of the area mapped, that the State and county are indicated, and that the year of the program is shown.

Following a check of the above data be sure that the commodity or use of each field is clearly printed in the center of the correct field, as shown on the map. In addition, any other compliance data, as required, should be inserted.

The farm supervisor should sign in the lower right-hand corner of the sheet as follows: Surveyed by—John Doe—February 24, 1937.

12. DETERMINATION OF ACREAGE IN THE FIELD

Frequently, before office computations can be made, the owner or operator may wish to know field acreages. This should be discouraged, but bearing in mind and impressing upon the owner or operator that the field computations furnished him are approximate only, and as such, are subject to change when office computations are made, the farm supervisor is authorized to advise the owner or operator the approximate acreages. To obviate the necessity of dividing by a larger number in obtaining these field computations, a table entitled, "Conversion Table Square Feet to Acres", may be found in the appendix. This table, the use of which is clearly explained, was prepared by the extension division of the University of Nebraska and is based on areas being obtainable in square feet.

Areas in square feet may be obtained by the usual practice of dividing the fields into squares, rectangles, triangles, or trapezoids computing by usual methods, summing up the areas of the component parts and then, rather than by dividing by 43,560 (square feet in 1 acre), the conversion table may be applied and the acreage read direct.

13. CHAINING WITH THE 100-FOOT ENGINEER'S TAPE

Each farm supervisor should be entirely familiar with accepted practices in chaining and should be sure that his assistants are accurate and efficient.

1. The head chainman should take the range pole, 10 chaining pins, and the "0" end of the tape, and start down the line he intends to measure. One chaining pin should be left at the starting point until the head chainman sets his first pin.

2. Unless some well-defined boundary line is being followed the rear chainman should align the front man with the point toward which the measurement is being made.

3. As the rear end of the chain approaches the point held by the rear chainman, the rear chainman calls "Chain" to indicate to the head chainman that he has reached a tape length. Watchfulness in this matter will reduce to a minimum the occasions for dragging the tape back, due to overrunning the point.

4. The rear chainman should then stand with feet well apart on the right side of the line facing the pin, holding the leather thong fastened to the tape in his left hand, and taking some of the strain by grasping the tape with the right hand. The 100-foot mark should be held at the ground beside the pin, if the front chainman is downhill from the rear chainman. If the front end of the tape is uphill from the rear chainman, the rear chainman should hold the 100-foot mark vertically over the chaining pin by means of a plumb bob. He should raise the tape sufficiently that the two ends are level assuring horizontal measurement. Practice will make this procedure easy. Hold the thong with the left hand and the string of the plumb bob in the 100-foot graduation mark on the chain, at the same time easing the strain with the right hand.

5. The front chainman, upon the rear chainman's call of "Chain", should stop, face the instrument, line himself in, with the help of the

rear chainman, assuring himself that the tape is free, straight, and unknicked. He should then estimate the slope and ascertain whether the rear chainman is holding the rear end of the tape at the proper elevation. In the event that the front chainman is downhill from the rear chainman he should hold the zero end of the tape sufficiently high for the tape to be level. When he is uphill from the rear chainman he should, of course, hold the tape on the ground. He should stand on the right side of the line facing the tape, with the thong in his right hand, and use the range pole with his left hand, as a plumb bob and to mark the point for the pin. By holding the range pole lightly with two fingers, above the center, the iron point will make the pole hang truly vertical and no error will occur.

The head chainman should be held responsible for the leveling of the chain and in general for the accuracy of the measurements.

6. The head chainman should steadily increase the tension on the tape until, in his estimation, he is exerting approximately a 12-pound pull. Ordinarily, when the chain is taut and the rear chainman is holding steadily on or over the point the rear chainman will call "All right" or "Stick." If at this time the head chainman is in readiness, he will drop the range pole or mark the point and answer "All right", or "Stuck." Any satisfactory system of signals may be devised.

7. The head chainman then should stick a pin in the point and move on toward the next station.

8. The rear chainman should pick up the pin and move ahead to the pin left by the head chainman. The rear chainman ordinarily carries the necessary stakes and the hand axe.

9. This procedure should continue until the end of the line is reached. If the line is more than 10 tape lengths (1,000 feet), when the head chainman sets his last pin he should wait until the rear chainman comes ahead. The rear chainman should then have 10 pins, the pin marking the last point being the 11th. These should be carefully counted, 1,000 feet tallied in the note book, the 10 pins turned over to the head chainman, and the procedure repeated.

In the event a pin is lost an immediate search should be made, for without the correct number of pins errors are likely to result.

10. At any point the number of pins held by the rear chainman represents the number of tape lengths that have been measured. Thus with a 100-foot tape, when the rear chainman has eight pins in his possession, 800 feet have been measured to the point where the head chainman has set his pin.

11. When the end of the line is reached the head chainman stops and signals the rear chainman. The rear chainman then holds the nearest foot mark at or over the pin in the usual manner, and the head chainman marks the point in the same manner as though a full tape length were used. The rear chainman then calls to the head chainman the foot length he is holding, which the head chainman repeats and notes. The rear chainman then goes ahead and reaches an agreement with the head chainman as to the total distance. Thus if the rear chainman has eight pins and holds the 40-foot mark for the fractional distance, he should call "40", the head chainman repeat, and the rear chainman count his eight pins. The count is checked by the head chainman and the distance 840 feet is entered in the notes.

12. Whenever possible, the head chainman should set the end point at zero on the tape, and likewise the rear chainman should, when possible, hold an even 10-foot mark or next best a 5-foot mark, when taking fractional tape lengths such as 40, 60, 70, or next best 35, 55, etc.

Occasions will arise, however, when it will be desirable to set a point at a particular place or to measure to a definite point. In this case the rear chainman should hold at his pin the foot mark that, when the tape is taut, allows the desired point to fall between the zero-point and the 1-foot mark on the tape. The head chainman then should note the number of tenths of a foot on the tape that extend beyond the pin or desired point. The rear chainman should call the number he is holding and the head chainman call "Cutting 5" or "Cutting 8", as the case may be. Thus, if the rear chainman were holding 40 and had 8 pins and the head chainman had called "Cutting 8", the rear chainman would call "39.2" and the total distance would be 839.2 feet.

13. Always stand on the right side of the tape. Figures read from the left are upside down and may easily be misinterpreted.

14. The tape should not be jerked; instead a pull should be exerted easily and steadily.

15. The tape should be kept level—on steep ground it may be necessary to measure in 50-foot or even 25-foot sections to keep it level. In those cases extreme care should be taken so that the pins are not mixed up. It is suggested that in such cases the head chainman stretch out the entire tape length, then come back and make the necessary breaks by holding the 25-foot mark or 50-foot mark, as may be necessary. When this point is marked, the rear chainman should come ahead and hold the same foot-mark over the temporary point that has been marked by the head chainman. Then the head chainman should select the next distance, such as the 25-foot mark, and repeat until the zero-end of the tape is reached, when the pin should be set in the usual manner.

16. The head chainman should always carry the zero-end of the tape.

17. The head chainman is responsible for the care of the tape.

NOTE.—(While these instructions are based on the use of the 100-foot engineer's tape for measuring, it should be understood that there is no objection to the use of other measuring instruments or devices, such as A-frames, bicycle wheels, other wheels, etc., provided the prescribed standard of accuracy is obtained. Measurement by "pacing" is not permissible.)

14. OFFICE PROCEDURE

1. Departure from the scale selected for the county must be approved by the State engineer. These departures should consist, in general, in mapping areas of extremely large farms for which a reduction in scale is necessary to conform to standard map sizes, and possibly in a few instances for very small farms in which intensive detail cannot be adequately shown on the selected scale. (See Field Procedure, p. 9.)

In selecting the scale consideration should be given to the following:

On a scale of 1 inch=400 feet, 1 miles is 13.2 inches.

On a scale of 1 inch=200 feet, $\frac{1}{2}$ mile is 13.2 inches

On a scale of 1 inch=400 feet, a 640-acre farm is 13.2 inches square.

On a scale of 1 inch=400 feet, a 160-acre farm is 6.6 inches square.

On a scale of 1 inch=400 feet, a 40-acre farm is 3.3 inches square.

On a scale of 1 inch=200 feet, a 160-acre farm is 13.2 inches square.

On a scale of 1 inch=200 feet, a 40-acre farm is 6.6 inches square.

In case of doubt give preference to the selection of the 1 inch=200 feet scale, which allows greater ease in delineating intensive detail.

The selected scale should be placed prominently on the map.

2. The adoption of a graphic method of mapping in the field simplifies the office procedure.

Systematizing the work is of primary importance.

The filing system should be simple and efficient.

One man should be responsible for securing available, preliminary data for field crews. This man should follow the priority indicated by the county supervisor and should impress this priority on the field men.

3. The farm supervisors should be instructed to contact the chief draftsman and to deliver field data to him. These data the chief draftsman should assign to the various draftsmen, giving consideration to the priority established. The chief draftsman should assign the field data whenever possible in collaboration with the farm supervisor. Before doing so he should review the submitted data to determine whether there are any questions relative to the map and whether the material is complete and adequate.

(In those counties using a field captain as outlined under "Organization", it is to be understood that the farm supervisors deal almost entirely with the field captains.)

4. The field sheet covering a survey having been assigned to a draftsman, an appropriate-sized map form should be selected. This form should be fastened in position over the field sheet, assurance having first been made that the data on the field sheet is clearly visible through the map form. In the event that some detail is indistinct these portions should be intensified by going over the lines with a sharp soft pencil. If all of the lines on the field sheet are indistinct, rather than attempt to intensify the entire field sheet, a light table or mimeoscope, simply constructed by placing lights under a section of glass, may be resorted to for the tracing work.

When the base map is traced from the field sheet only such matter should be traced as will constitute the permanent map of the area (see 3 A, p. 3), and only such information as pertains to the year's farming operations should be omitted from the tracing. The reason for this is that the base map as traced will be reproduced in white prints, which will be used in determining extent of performance in succeeding years, or for the current year, if performance is not determined at the time of mapping.

In orienting the map form over the field sheet always attempt to locate the area outline on the map form in such a manner that the north side of the area will fall at or near the top edge of the sheet.

5. All of the data delineated on the field sheet should be traced on the map form by the use of different weights of pencils so as to give proper importance to the different features.

6. Fancy drafting should not be attempted. Single stroke letters and figures, and clear, sharp lines should be made. Uniformity in lettering and in the use of symbols is essential. The paper adopted for this use will not stand erasing.

7. Land description must be shown clearly on the map.
8. The scale must be indicated, also directions by use of the north arrow.
9. The initials of the farm supervisor and date of survey must be transferred to the tracing.
10. The tracer must initial the tracing and show the date.
11. Tracing should be checked for completeness and delivered to the chief draftsman.
12. In the event that performance has been determined by the farm supervisor at the time of mapping, the field sheets should be turned over to a planimeter operator to determine acreage in various crops or acreage devoted to soil-building practices. If performance has not yet been determined, field sheets should be returned to case file for later use in this connection. (In subsequent years, white prints of base maps will be used for determining performance.)
13. The base map will be filed for later use.
14. The planimeter operator will fasten the sheet on the table preferably with scotch tape, set the planimeter in position so that the instrument is approximately centered above the top of the sheet and in such a manner that the bearing wheel will not roll off the edge in following the boundaries, with the tracer arm.
15. The constant of the planimeter should be previously determined by adjusting the bar setting to a point that will assure that the reading, when multiplied or divided by an even number, will give the area in acres. (It is usually possible to set the planimeter in such a way that two or four tracements of an area will give the acreage direct.) The tracer point should be set over a sharp definite point such as a corner of the field to be measured. Do not attempt to set the indicator at zero with the tracer arm on the beginning point. Rather set the tracer arm over the point, read the indicator, and note the reading on scratch paper. The tracer point should accurately follow the boundary of the field to be measured. Upon completing the circuit stop with the tracer point over the beginning point the indicator should again be read, noting the reading over the original reading. This operation should be repeated and the last reading noted. The first reading should be subtracted from the second, and the second from the third. If the results do not agree within 1 percent, the process should be repeated until agreement is reached.
- The instrument should not be cramped, and settings that necessitate movement of the tracer arm to or near its limits should be avoided. It will be preferable to divide the field or area and measure the component parts.
- Place the decimal point carefully. After some practice approximate acreage of a given area may be easily estimated. This faculty should be developed, as it will reduce many serious errors.
- The planimeter should be operated in a clockwise direction.
16. The various fields should be designated alphabetically by means of capital letters within circles, beginning with A and running through the alphabet as needed. Should there be more than 26 fields in one farm the designations of the additional may be shown by a capital A and the appropriate small letter, as Aa, Ab, Ac, etc. These designations may be assigned in the field if desired.

17. Accordingly having designated the fields and having determined and checked the areas, the planimeter operator very lightly will pencil the correct acreages in the center of the respective fields.

18. Having satisfied himself that the acreages are correct, the planimeter operator should initial the sheet, indicate the date computed, and deliver it to the chief draftsman.

19. The tracings should be held in a special file.

20. Those counties that have not yet been provided with a planimeter may compute the field areas by the mathematical method.

In these instances irregular or odd-shaped fields should be divided by very light lines into convenient triangles, rectangles, squares, trapezoids, etc. The unmeasured distances should be scaled and formulae set up, after which the equations may be expanded on calculating machines.

For the solution of triangles it may occasionally be desirable to determine the area by means of the one-half sine rule. In this event measure the angle between two sides of known length by means of a good protractor. In the appendix will be found a table of natural half sine value. Under the heading "Value to Use", in the table opposite the angle measured with the protractor, obtain the proper factor. The product of the measured sides, including the measured angle multiplied by the value obtained from the table, will give the area of the triangle.

21. It should be constantly borne in mind that the mapping program is first and only for the purpose of properly carrying out the agricultural conservation program and for maintaining adequate compliance records and the efforts of both field and office organizations should always be directed toward that end.

The office organization should exert every effort to keep the field men supplied with all necessary data, as only in this way can the efficiency of the entire organization be maintained.

15. SPECIAL CASES

To a material degree the efficiency of the field crews will depend on the experience and initiative of the field captain. These men should be experienced in agricultural conservation work and should have full understanding of the technical aspects of this work. The field captains will be responsible for the efficiency of their units and in this respect will be operating on a competitive basis. They will act as liaison officers between the county supervisor's office and the field crews and will keep their crews supplied with the necessary data. They will assist in the training of the men and during the early stages of the work should spend as much time as possible with each crew.

In addition it is likely that problems may be encountered of more than ordinary difficulty. In these cases the captain will be expected to take charge of a crew and make the survey personally. In these cases standard accuracy will be maintained and uniform symbols used. In every respect the map will be comparable to the usual map. If it is considered expedient, however, other procedures may be followed in the field. Assuming that the field captain is competent, any accepted engineering practices may be used.

Should a transit be used for angulation, it will be expected that the captain compute and plot the field notes personally, using latitudes and departures and rectangular coordinates, at least for exterior boundaries.

Since a man capable of making an accurate transit survey will be familiar with this method of computing and plotting, it will not be explained here.

The use of stadia is not recommended for isolated cases. The use of stadia for accurate measurement necessitates determining the instrument constant, reduction of slope readings to horizontal, and usually a recorder in addition to a very experienced rodman, consequently it is felt that better results can be attained by holding to the chaining procedure even in making special surveys.

16. SUGGESTED PROCEDURE FOR SELECTION AND TRAINING OF APPLICANTS

These suggestions are made on the assumption that in each county the county supervisor will already be employed. It is of course highly probable that in each county there are also available for employment a number of capable men who, through experience with the production control and agricultural conservation programs during the past 3 years, are entirely familiar with the requirements for determining compliance.

It is hoped that a nucleus of these experienced men can be assembled to assist in the training work and for assignment to the key positions such as chief draftsman and field captains.

It would be desirable also that a district engineer assist in the training work if a convenient schedule can be arranged.

Assuming that the nucleus of the organization as mentioned above is available and that the county has on file sufficient applications to complete the organization, it is suggested that a program approximating the following plan be initiated:

1. Schedule the time for training school.
2. Assemble the experienced key men, advise them to assimilate thoroughly the new mapping instructions, and, if possible, provide an opportunity for these men to obtain some proficiency with the instruments in the field.
3. Notify the applicants of the dates of the training period. (It is to be understood that no salary or expenses will be allowed for the training period.)
4. Assemble equipment on a basis of 1 complete outfit for approximately every 50 field sheets to be made, varied according to local conditions and in line with past experience.
5. School should be held in a suitable place, where seating can be arranged, where it is possible for the applicants to take notes, and where a blackboard is available for illustrating purposes.
6. **First Day, a. m.**—The agricultural agent should explain in detail the problem at hand, describe briefly the agricultural conservation program, list the compliance data required, explain its use, emphasize the necessity for maintaining cooperative relations with the farmers, and in general thoroughly familiarize the applicants with the details of the work.

First Day, p. m.—The county supervisor, district engineer, or other qualified engineer should describe briefly the proposed use of the map, the difference between the old procedure and the proposed procedure, and by demonstration and illustration show the use of the various instruments. It is suggested that the instructions be covered step by step until every phase of the work is understood by each man.

7. Second Day.—Divide the applicants into groups, using judgment in selecting the tentative farm supervisors and explaining to the men selected as chainmen that opportunities will arise from time to time for promotion, when the outstanding chainmen will be given opportunity to qualify.

The entire group should then go to the field and each group make an actual map of a selected area. A small area may be used, but if possible an area presenting a number of usual problems should be selected. It is possible that two relays of groups may be used in order to give a larger number of men opportunity to compete. Every assistance should be given the applicants and their adaptability observed during the course of the work. The test and demonstration should include the care of equipment.

The men observed to be especially apt in evaluating the resulting maps should be noted. Applicants may be released at the end of the second day.

8. The required organization should be selected on the basis of the notes made during the test and of a comparison of the maps turned in by the applicants. Men not particularly apt at plane-table work may make excellent chainmen. Until their competence is absolutely assured the training of farm supervisors should be continued by field captains during the early stages of the work. This procedure will mean continued weeding out of incompetents and promotion of chainmen or other selection of farm supervisors until a reliable organization is assembled.

17. CARE OF INSTRUMENTS AND EQUIPMENTS

Office.—1. Each draftsman should be made responsible for the instruments or materials assigned to him.

2. Dropping or bending triangles should be avoided as the precision of a triangle is easily affected.

3. Use of the engineer's white-edged scale as a straightedge for drawing lines should be avoided as the graduations become worn and scratched and materially affect scaling.

4. The planimeter is a very delicate instrument. Straining any motion of the instrument should be avoided; it must be protected so far as possible from dust and, above all, it must not be dropped. The instrument must be in the box at all times when not in use.

Field.—1. The farm supervisor is required to personally care for the alidade and plane-table board.

2. The precision of the alidade and consequently the accuracy of the field work is dependent on keeping the instrument in first-class condition. Straining, jarring, or dropping should be avoided. The alidade must be in the leather case when not in use. In wet weather

it should be wiped carefully before putting it in the case. An occasional check of the instrument, for collimation, particularly if it is believed to be out of adjustment, should be made. A check in the following manner is suggested:

Using the alidade as a straightedge, a line should be drawn with a sharp, hard pencil. Reversing the alidade and with the edge carefully placed along the previously drawn line, a second line should be drawn. This should coincide for the full length with the first line. If it does not the two lines may coincide at the ends and depart near the center or conversely. Repeat the procedure. If it appears that coincidence is not obtained it is obvious that the straight edge of the alidade has become warped and should be sent to a reliable instrument company for correction. Before sending an instrument in, both edges of the alidade should be checked.

The collimation check may be made by setting up at any point A, by sighting carefully at point B any known or unknown distance away, drawing line AB on the paper. As scale is immaterial, the line should be approximately the length of the alidade. Moving to point B and sighting on point A with the edge of the alidade exactly alongside of point B, a line should be drawn BA. If the lines coincide, the instrument is in adjustment. If there is a noticable difference, the sights are not perpendicular or are not parallel to the straightedge. In this case the instrument should be sent in for repairs.

In checking instruments precisely it is essential that an offset plumb bob be used in order that the plane table may be set up so that points A and B, as designated on the paper, will be directly over the corresponding points on the ground.

It is suggested as good policy that each county have on hand one or two extra alidades for replacement, in the event some instruments must be sent in for adjustment.

3. The plane table board should be kept clean and varnished to prevent warping.

4. The tripod head is made of brass or bronze and is therefore soft. Extreme care should be taken to avoid stripping or cross threading. Usually tripod heads are provided with a cap. Whenever the tripod is not in use the cap should be in place to protect the tripod head.

5. **Care and Repair of Steel Tapes.**—Steel tapes will stand considerable abuse. However any tape will break when kinked and subjected to a light pull. A tape that has not been done up properly invariably tends to kink when being uncoiled. Anyone using a tape should know how to do it up, how to “throw” it in a double circle and also how to let it out again. The district engineer or another qualified person attending the training school should instruct chainmen in the proper method of doing up and letting out a tape.

When measuring, the tape should at all times be extended its full length. Often the rear chainman, when returning the chaining pins to the front chainman, has a habit of carrying the rear end of the tape with him. As the front chainman proceeds forward the doubled tape often forms a loop or kink. This habit is the cause of many broken tapes and should be discouraged.

A tape can be taken, for short distances, from field to field or from farm to farm by simply dragging it along. Dragging the tape

on hard or gravelly surfaces, however, will cause the babbitt graduations to wear off.

Vehicles must not be drawn over the tape.

Steel tapes rust easily and when not in use should be kept in a dry place. If the tape is damp at the end of the day's measuring, it should be dried through a cloth moistened with oil. Whenever the tape is to be put away for a considerable length of time, a light application of thin oil is advisable.

Repairing Broken Tapes.—Broken tapes can be repaired easily and successfully. A specially prepared sleeve that can be applied to the tape without damaging the tape or impairing its accuracy can be obtained at a very small cost. Any methods of repairing tapes that require considerable heat, such as welding or brazing, tend to ruin them. The heat applied will affect the temper of the steel 2 to 3 inches on either side of the splice, causing that part to be brittle and break under the slightest bend.

When applying a tape splice, follow the directions given below:

1. Hammer down the burr at the broken ends of the tape.
2. Clean the surface of the tape with a knife or sandpaper.
3. Insert the broken ends into the sleeve.
4. Hammer the sleeve so that it closes down well on the tape.
5. Hold a lighted match under the sleeve while it burns itself out.
6. Let the newly formed splice cool and do not move the tape while it is cooling.

Each head chainman must be supplied with a package of tape splices in order that delay in the field may be reduced to a minimum in the event of breakage.

In ordering tape splices, the tape width should be specified.

The head chainman will be held responsible for the care of the tape.

18. INSPECTION AND CHECKING

1. County Supervisor.—It will be the responsibility of the county supervisor to have adequate check systems devised and maintained in the field and office. The county supervisor should consult with the chief draftsman concerning the adoption of a procedure that will insure the reliability of acreage determination. Ordinarily separate computation by independent operators is considered the best possible check. Due to variance in organizations, however, some counties may not be prepared to adopt such a method. The county supervisor however, should personally review a number of completed maps currently, to ascertain that the maps are complete and that the data are properly assembled and delineated.

The county supervisor should arrange to accompany each of his field captains, at some time early in the program, to determine whether each field captain is efficient, thorough, and is properly conducting the check surveys. He should note also the resurvey reports made by the field captains, assure that they are properly distributing the check surveys, that general uniformity is being attained, and consult with them concerning organization improvement needs as indicated by the resurvey reports. The county supervisor should confer frequently with the field captains relative to the progress of the work.

He should facilitate in every way possible the inspection and rechecking work done by district engineers or the regional office representatives.

2. Field Captains.—In addition to successively accompanying each of his farm supervisors for a considerable period of time, assisting, advising, and instructing them as to methods and technique, the field captain should make a physical resurvey or check of a portion of each of several areas mapped by each of his farm supervisors.

The revised mapping policy makes it impracticable to attempt to recheck a large number of complete areas, and it is believed that well-distributed partial resurveys will indicate clearly the reliability of the work.

Accordingly, in checking each farm supervisor, the field captain should select at least three areas mapped. He should proceed to the area, select a portion covering two or more fields, and remap this area in every detail. His resulting partial map will be signed, dated, and properly referenced to the original survey for filing. The partial map should bear prominently the word "RECHECK."

Care should be taken to adequately tie the resurveyed portion to a long side of the original survey in order that it may be properly oriented for comparison.

Having completed the partial recheck surveys for a field captain, comparison should be made by superimposing one map over the other. Due to action in the paper approximately uniform differences may obtain in each direction. Should this occur, the adherence of the paper to scale at the time of plotting should be checked by scaling measured distances in both directions and consideration should be given to shrinkage or expansion of the paper in evaluating the original survey.

Each field captain should keep a record of the physical rechecks made for ready reference. Rechecks indicating exceptionally fine work might be colored in red and mounted in a conspicuous place, superimposed on the original, as a stimulus to other crews.

One survey may contain discrepancies. If this occurs the errors should be isolated and corrected at once. In the event that the surveys of a farm supervisor appear to consistently vary from 2 to 5 percent from a careful recheck the matter must be reported to the county supervisor without delay. Either the man is incompetent or at fault in his methods. In any event the errors must be corrected and action taken to prevent their recurrence.

Under the direction of the county supervisor, an outline (wall) map of the county should be prepared, on which may be shown legal subdivision boundaries and, in a temporary fashion, the area assigned to each field captain or farm supervisor. As the mapping progresses, record may be made on this map, also in a temporary fashion, of the areas mapped. This will serve to show progress of the work and finally that no part of the county's agricultural land participating in the program has been overlooked. In counties without a general land office survey, for which arbitrary divisions have been made for mapping purposes, this wall map will serve to show definitely (and permanently) such arbitrary divisions and will provide a means for locating each farm, and likewise maps of

such farms. This wall map will become a valuable source of information in the work of any county association.

On the wall map the field captain should indicate the location of the physical recheck surveys by means of a small circle. The recheck maps should be maintained in the county office in order that the county supervisor or inspecting officers may be currently informed as to the amount and distribution of the resurveys.

3. District Engineer.—The duties of a recheck engineer are:

a. To be responsible for the successful completion of the mapping work in his assigned group of counties.

b. To assist in properly organizing the work for each county.

c. To check carefully all field work including recheck surveys by field captains.

d. To check methods in use by both field and office forces, determining whether sufficient adherence to these instructions or other proper methods is maintained to give satisfactory results.

e. The recheck engineer and assistants should check personally 1 percent or more of the surveys in a county that is well distributed among the several field captains or farm supervisors.

f. To report to State engineer periodically, or as may be required by the progress of the work in the assigned counties, the reports to include comments or recommendations that may be of interest or value.

g. Decide matters of controversy between county forces and farmers as to measurements or acreages. The recheck engineer in making surveys may use the traverse board equipment prescribed herein or any other generally accepted surveying equipment which may be available.

The district engineers will, in effect, sample the quality of the work done in each county. The practice of resurveying a portion of several tracts, as outlined for checks by field captains, is suggested.

District engineers should be thoroughly familiar with the methods used by the local workers; with the local as well as general instructions the workers have received; and should recognize that such factors as instructions, equipment, size of fields, and character of topography have an influence on performance that should be considered in application of tolerance limits.

Areas as determined by the original survey should check within 1 percent of the areas as determined by the resurvey. The actual tolerance therefore with respect to measurement is less than 1 percent and under average conditions should be less than one-half of 1 percent which is the basis for the 1 percent area tolerance.

Angle tolerances allow for a difference of one-half degree on any angle.

In actual practice, it will be found that many surveys made by farm supervisors will not check within 1 percent on a basis of the above tolerance. It is impossible to set any hard or fast rules to decide when the work of a farm supervisor shall or shall not be accepted. Considerable judgment should be exercised. The fact that one or two surveys of a farm supervisor happen to be slightly in error need not be an excuse for turning down all of his work. If, however, most of the surveys which were rechecked show errors, and this is further borne out by the rechecks made by the field

captain, then the matter should be reported to the county supervisor and arrangements made to correct the condition.

In such an instance it is suggested that the farm supervisor not be discharged at once but rather, unless the case appears hopeless, that some time be spent in intensive training of the man. Bear in mind that anyone employed to replace him may be no better.

The attitude of the district engineer should be one of helpfulness. He is expected to assist in raising the standards of the work in the counties to which he is assigned.

The resurveys made by the district engineer should be marked with a large black "R" and filed in the appropriate folder in the office of the county supervisor.

Leave one copy of any report in the office of the county supervisor. The district engineer is required to make a report for each county in his assigned area as to the acceptability of the mapping work of field and office forces.

A form for the report of district engineers will be forwarded during the progress of the work.

4. State Engineer.—It is not proposed that the State engineer conduct physical rechecks of field surveys. He should function as coordinator for the State, and as such, through the district engineers, make certain that uniformity and adherence to standards are being maintained throughout the State.

In this capacity he should inform himself as to the competence and efficiency of his district engineer. If practicable this should be done by accompanying each one on a field trip and observing his work.

The State engineer should review the reports of the district engineers, and with their recommendations in mind he should take the action necessary to effect improvement.

It is suggested that on a State map the areas assigned to the various district engineers be outlined and as resurveys are reported that the approximate location of the resurveys be indicated, in order that a graphic record showing the amount and distribution of checking work may be available for the State engineer and for regional officers.

The State engineer should provide for the distribution of revisions in procedure and improvements in technique. In the event that the reports of the district engineers indicate that the surveys in one territory are consistently below the average, the State engineer should accompany the district engineer in the field to observe the reasons and assist in correcting the condition. It is always possible that the differences may be due entirely to characteristics of the district engineers or possibly to differences in interpretation of the tolerances.

The State engineer should act as liaison officer between the State and the regional office and should report State progress currently.

In order that efforts toward improvement may be directed toward those States having poor records, and for the information of the Director or his assistant, the ground surveys engineer should arrange for the maintenance of a current record showing, comparatively, the progress and costs of the individual States.

19. ANNUAL RENEWAL

Each year a new map will be necessary to represent changes in cropping of the various fields, etc., on each farm participating in the program. It is not anticipated, however, that an extensive remapping program will be necessary.

It is suggested that approximately the following procedure will fulfill the requirements of the Agricultural Conservation Program.

Each year the field crews making compliance investigations will visit each participating farm, equipped with a copy of the original map. The crews will observe changes in conditions, and, by using a red pencil, indicate the changes on the copy of the original map. Often these changes may represent only rotation of crops from field to field, the areas of which have not changed and which have been measured and indicated on the original map. On the other hand it may be necessary in some instances to resurvey several fields. In any event the distances from fences or permanent features to neat crop lines should be measured and checked against the map and the necessary changes made in red.

The map copy then should be submitted to the Supervisor, who will arrange to have a new tracing made and the acreage of the changed fields determined, after which prints will be made and the new map filed in a separate envelope marked in the same manner as described in the case of the base map.

APPENDIXES

APPENDIX I

SUGGESTED SYMBOLS

1. CIVIL BOUNDARIES: *To be delineated in the office if considered pertinent to the Farm Map. In the event that the farm boundaries are fenced the fence symbol will be used rather than the civil boundary.*

State -----	-----
County -----	-----
Township -----	-----
Section lines -----	-----
Spanish Grant lines -----	-----

2. FENCES: ----- x—x—x—x—x—x—x—x—

Drifted fences indicate only serious conditions

x—x— | — | — | — x—x—

3. PIPE LINES AND POWER LINES:

Pipe lines -----	-----
Power transmission lines -----	-----

4. ROADS, RAILROADS, ETC.

Hard surfaced highway -----	-----
Semi-hardsurfaced such as gravel ----	-----
Public dirt road -----	-----
Field road or private road -----	=====
Highway bridge -----	-----
Railroad bridge -----	-----
Ferry -----	-----
Ford -----	-----
Dam -----	-----
Railroad, single track -----	-----
Railroad, double track -----	=====
Railroad station -----	-----
Grade crossing -----	-----
Railroad above highway -----	-----
Railroad beneath highway -----	-----

SUGGESTED SYMBOLS (CONTINUED)

5. BUILDINGS:

Residence ----- ■
School ----- ■
Church ----- ■
Other buildings ----- □ □ □

6. CEMETERIES:

Outline and indicate thus: -- □ +

7. MINES, QUARRIES, OR GRAVEL PITS

----- ✂


8. AIRWAY BEACON

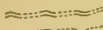
----- ★


9. INSTRUMENT STATION OR PERMANENT MONUMENT


----- △

10. DRAINAGE SYMBOLS:


Continuous streams-- 

Intermittent streams-- 

Streams whose channels disappear in sinks 

Streams which terminate on flats or alluvial fans 

Canals or ditches ---- 

Lakes or ponds ----- 

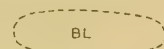
Intermittent lakes or ponds --- 

Spring ----- 

Marsh ----- 


Well or water tank ----- ○

11. BOUNDARY OF ANY AREAS DESIGNATED BY SYMBOLS WITHIN THE AREA THUS:

 BL


12. MINOR SUBDIVISION LINES FOR USE WHERE PERTINENT

Quarter section lines ----- 

Smaller subdivision or lot lines ----- 

Section corner found ----- 

Section corner plotted, not found ----- 










Quarter section corner found ----- 

Quarter section corner not found ----- 







Center of section ----- 

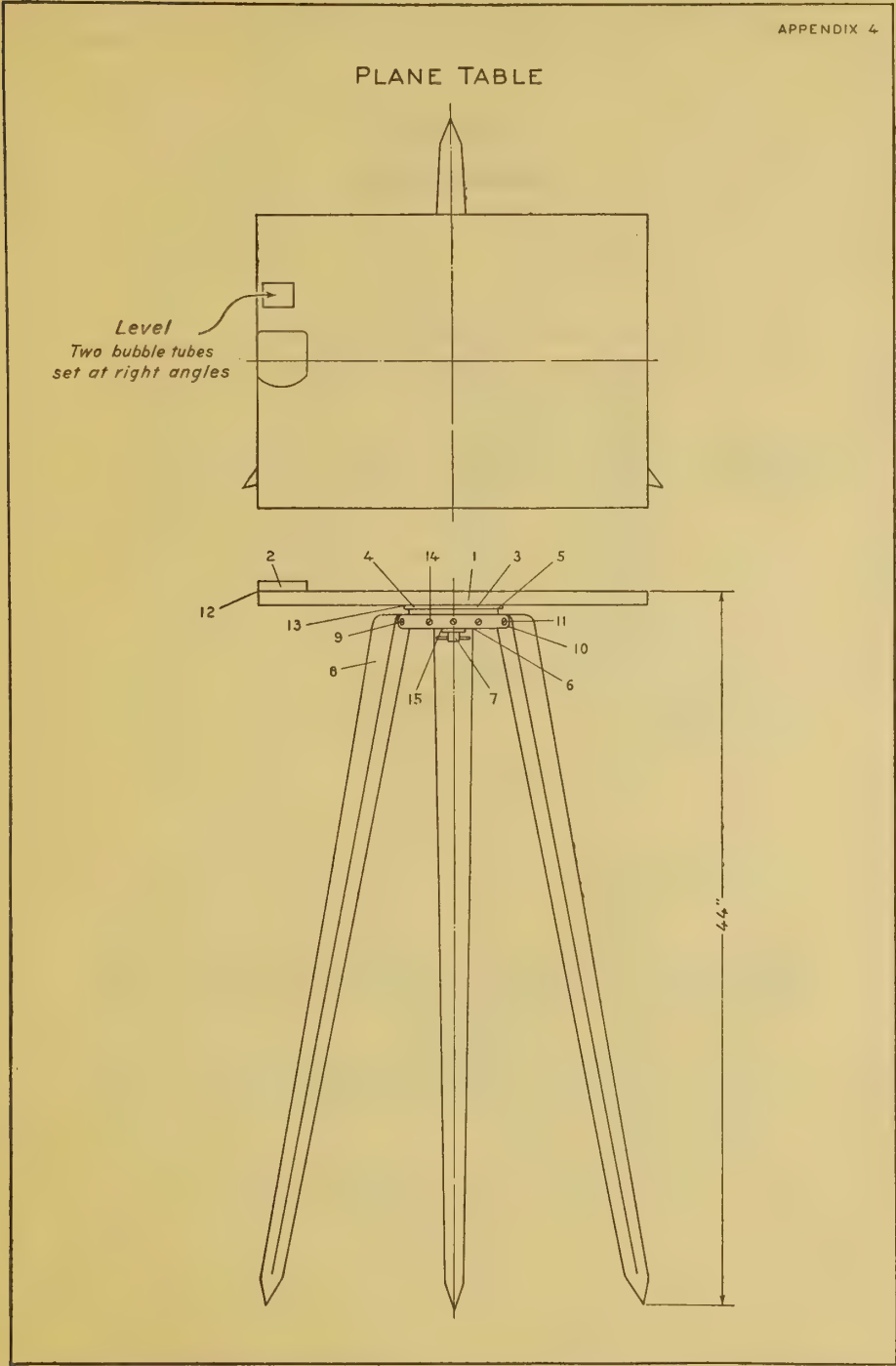
SUGGESTED SYMBOLS (CONTINUED)

13. NATURAL FEATURES:

<i>Woods, outline</i> -----	 WOODS
<i>Bluff or cliff</i> -----	
<i>Peak</i> -----	
<i>Sand bar or dune</i> -----	
<i>Gravelly areas</i> -----	
<i>Stony areas</i> -----	
<i>Rock outcrop</i> -----	
<i>Slope, too steep for cultivation</i> -----	
<i>Erosion prohibiting or seriously affecting cultivation, symbol within area outlined as shown under 11.</i> -----	

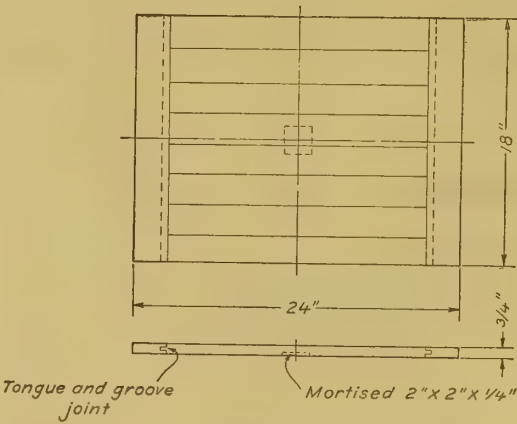
14. SYMBOLS FOR DESIGNATING SOIL CONSERVING PRACTICES OR FEATURES

<i>Levees</i> -----	
<i>Sluice gates</i> -----	
<i>Terrace</i> -----	
<i>Pasture furrowing</i> -----	
<i>Basin listing</i> -----	
<i>Soil saving dams</i> -----	

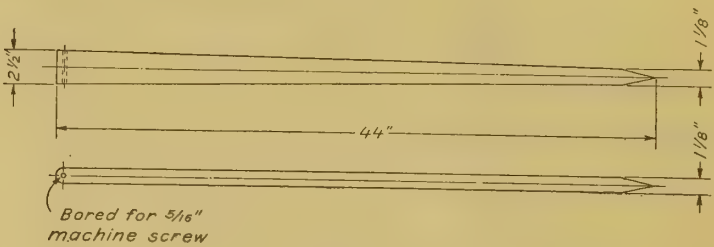


APPENDIX 4

PLANE TABLE

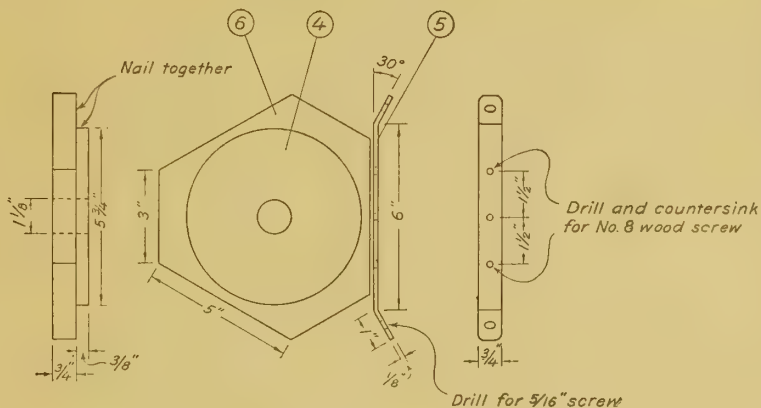


ITEM NO. 1



ITEM NO. 8

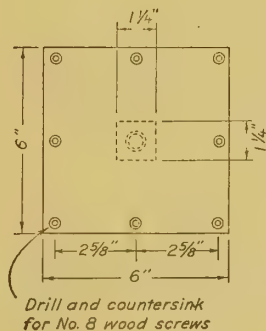
TRIPOD BASE



ITEMS 4, 5 AND 6

SCALE IN INCHES

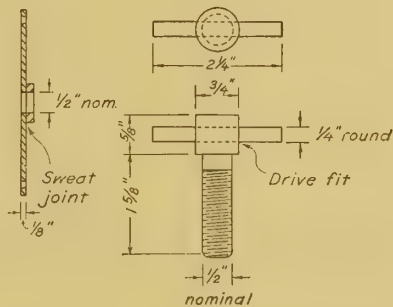
0 1 2 3 4



ITEM 3

SCALE IN INCHES

0 1 2 3 4



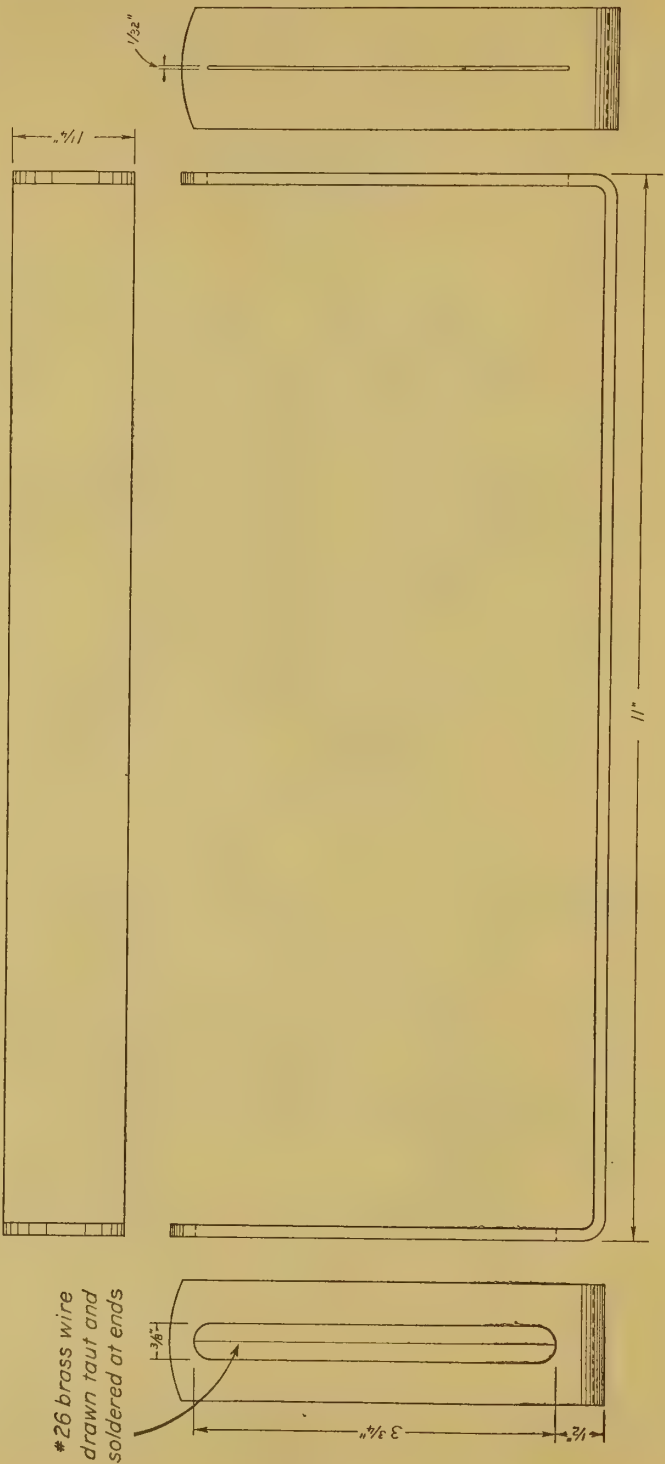
ITEM 7

SCALE IN INCHES

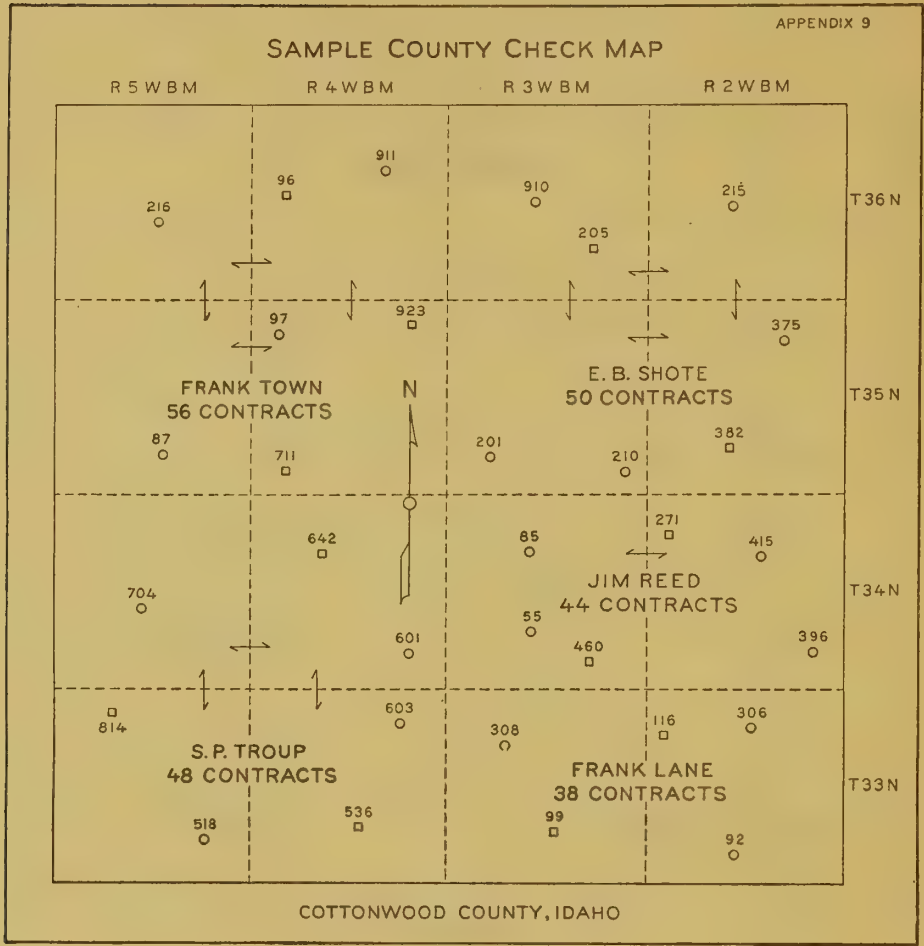
0 1 2 3

APPENDIX 7

BRASS ALIDADE



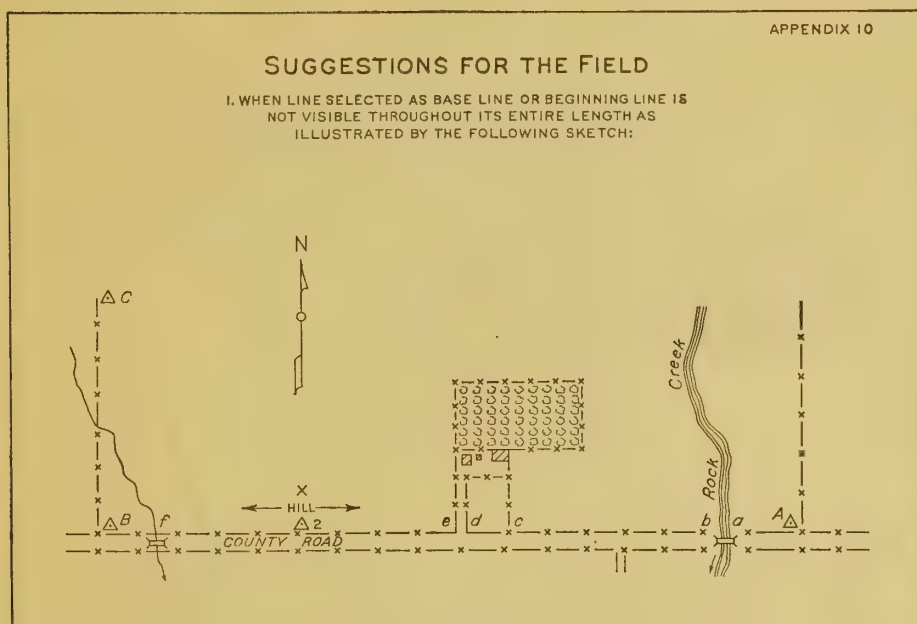
APPENDIX 7



APPENDIX 9

Any map obtainable of the county will be satisfactory provided it shows townships, or individual sheets covering the respective areas assigned to each field captain are permissible.

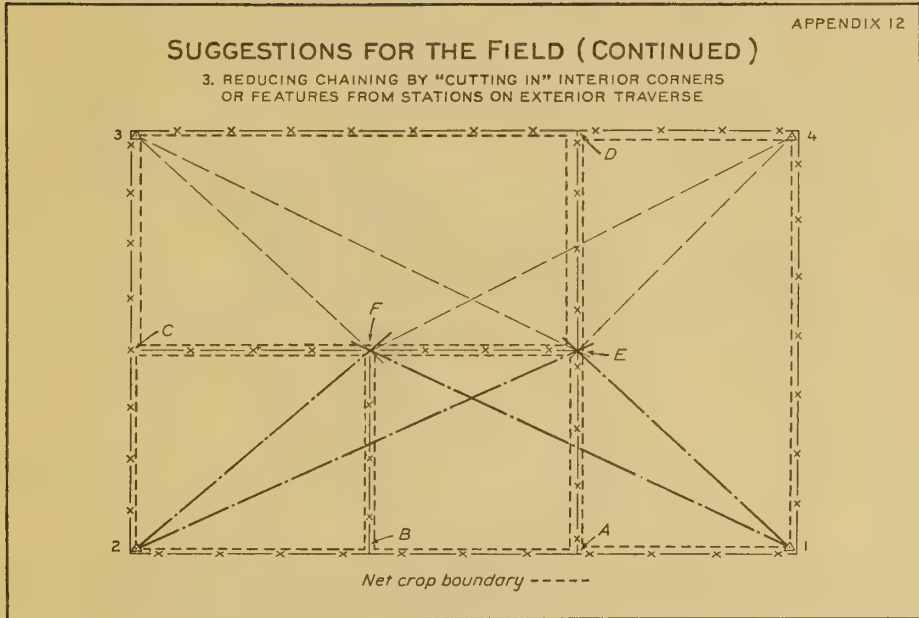
Above is a sketch of a map showing assignment of areas to five field captains on which is indicated a satisfactory distribution of check surveys by field captains and by the State inspector. In this instance the field captain rechecks are shown by a circle and the district engineers resurveys by means of a square. Colors may be used if preferred for differentiating between check surveys by field captains and by district engineers.



APPENDIX 10

When nature of terrain such as hill at X on the sketch prevents visibility from A to B select A as initial point, mark with stake designated number 1. Set up an instrument on hill X, if possible, at such a point that both A and B are visible. Draw base line on sheet as usual with board in orientation, point A having been designated. Start chaining crews at A chaining toward X. When distance AX is measured and reported stake the point on the ground, mark it no. 2, scale and plot the point on the sheet and consider this set-up identical in every way to the usual station. Chain XB, sight on B and plot the reported distance in the usual manner. Do not make the mistake of assuming that station B is on a prolongation of line AX as plotted. A slight angle might, in fact usually will, obtain at this point.

En route from A to X and from X to B chaining crews should obtain and record the distance from A to the features encountered between A and X such as both sides of a large creek (a, b) bridge opposite, cross fence, north (C) lane (d, e) and between X and B small drain (f), bridge opposite (distance from X or station 2). These distances are commonly referred to as plus distances. Thus in the sketch the distance would be recorded as follows: a=2+90, b=3+05, c=11+00, d=12+95, on the second course f=5+00.

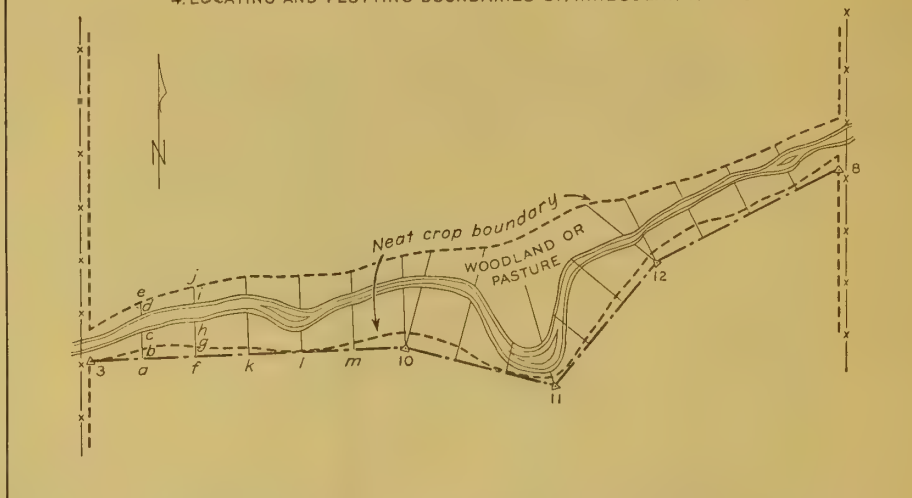


APPENDIX 12

Assure that chaining crews appreciate the importance of obtaining distance from fences to crop line at A and B in chaining line 1-2, likewise at C on chaining line 2-3 and at D in chaining line 3-4. Arrange to have sights placed at E and F at which time measurements from fences to net crop boundaries at these points should be obtained. While set up at station 1 sight on E and F respectively, draw sight lines on sheet. When set at station 2 with board oriented sight E and F again and draw the lines forming the intersections locating these points. Connect points E and F, points A, B, C, and D having been plotted in accordance with chaining notes connect points FC, FB, EA, and ED and draw the net crop lines according to reported distances. While set up at points 3 and 4 sight F and E again, visibility permitting as a check on the location of F and E.

SUGGESTIONS FOR THE FIELD (CONTINUED)

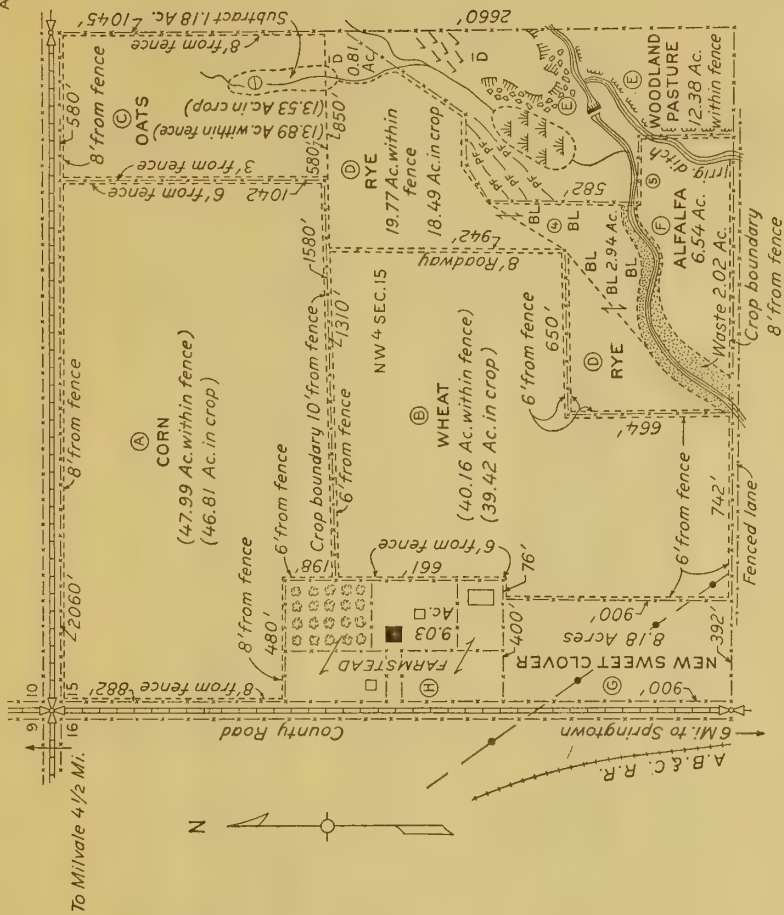
4. LOCATING AND PLOTTING BOUNDARIES OF IRREGULAR AREAS



APPENDIX 13

To a large extent the method to be used for acreage determination will control the field methods to be used in defining and locating irregular areas, for example in the above case the areas are to be computed, insofar as possible the cross sections should be taken at regular intervals. In this case it would perhaps be desirable to locate the base line traverse on the north side of the stream. If acreage is to be measured by planimeter the cross sections may be spaced to fit the features. In any event if the stream cannot be easily crossed a traverse must be run on both sides. The traverse on the north side would then be for the purpose of locating the crop boundary as the north bank of the stream may be determined with sufficient accuracy by estimating the width. The above sketch is on the assumption that the stream may be crossed at any point. Knowing that the area must be determined stations 3 and 8 should be set at the time the exterior traverse is run. Run traverse 3 to 10, to 11, to 12, to 8 in the usual manner. Attempt to place the stations so that visibility is good. Chaining crews having marked points at known intervals such as a, f, k, e, m, etc., and reported these distances to the farm supervisor will proceed with the cross sections. The sections must be at right angles to the base line except at instrument stations where the line may be sighted as indicated in the sketch. On all lines such as ae, fj, etc., the chaining crew will report as indicated by letters b, c, d, e and g, h, i, j the total distance from the base line to crop boundary, stream bank, stream bank and north crop boundary. The farm supervisor will plot these distances as reported and will sketch between the plotted points. In the event that a traverse must be run on each side of the stream the irregular area should be considered as a unit and accuracy to the limits established should be maintained in closing the traverse.

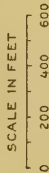
APPENDIX 14



LOCATION NOTES

FARM OF JOHN DOE: 6 MILES NORTH OF SPRINGTOWN ON SPRINGTOWN-MILVALE COUNTY ROAD, ON EAST SIDE OF ROAD AT POINT WHERE A.B. & C. R.R. DEPARTS FROM THE COUNTY ROAD, ONE HALF MILE SOUTH OF CONCRETE BRIDGE OVER RED RIVER.

IDENTIFIABLE BY VERY OLD LOG CABIN (NOT IN USE) NEAR GATE.



APPENDIX 14

APPENDIX 15

COMPUTATION OF AREAS OF TRIANGLES

(**RULE.**—The area of any triangle is equal to the product of any two sides multiplied by the value indicated in this table for the angle between the sides.)

Table of natural half-sine values

Acute ¹ angles (degrees)	Value to use	Obtuse ² angles (degrees)	Acute angles (degrees)	Value to use	Obtuse angles (degrees)	Acute angles (degrees)	Value to use	Obtuse angles (degrees)
0	0.000	180	12	0.104	168	24	0.203	156
0¼	.002	179¾	12¼	.106	167¾	24¼	.205	155¾
0½	.004	179½	12½	.108	167½	24½	.207	155½
0¾	.007	179¼	12¾	.110	167¼	24¾	.209	155¼
1	.009	179	13	.112	167	25	.211	155
1¼	.011	178¾	13¼	.115	166¾	25¼	.213	154¾
1½	.013	178½	13½	.117	166½	25½	.215	154½
1¾	.015	178¼	13¾	.119	166¼	25¾	.217	154¼
2	.017	178	14	.121	166	26	.219	154
2¼	.020	177¾	14¼	.123	165¾	26¼	.221	153¾
2½	.022	177½	14½	.125	165½	26½	.223	153½
2¾	.024	177¼	14¾	.127	165¼	26¾	.225	153¼
3	.026	177	15	.129	165	27	.227	153
3¼	.028	176¾	15¼	.132	164¾	27¼	.229	152¾
3½	.031	176½	15½	.134	164½	27½	.231	152½
3¾	.033	176¼	15¾	.136	164¼	27¾	.233	152¼
4	.035	176	16	.138	164	28	.235	152
4¼	.037	175¾	16¼	.140	163¾	28¼	.237	151¾
4½	.039	175½	16½	.142	163½	28½	.239	151½
4¾	.041	175¼	16¾	.144	163¼	28¾	.240	151¼
5	.044	175	17	.146	163	29	.242	151
5¼	.046	174¾	17¼	.148	162¾	29¼	.244	150¾
5½	.048	174½	17½	.150	162½	29½	.246	150½
5¾	.050	174¼	17¾	.152	162¼	29¾	.248	150¼
6	.052	174	18	.155	162	30	.250	150
6¼	.054	173¾	18¼	.157	161¾	30¼	.252	149¾
6½	.057	173½	18½	.159	161½	30½	.254	149½
6¾	.059	173¼	18¾	.161	161¼	30¾	.256	149¼
7	.061	173	19	.163	161	31	.258	149
7¼	.063	172¾	19¼	.165	160¾	31¼	.259	148¾
7½	.065	172½	19½	.167	160½	31½	.261	148½
7¾	.067	172¼	19¾	.169	160¼	31¾	.263	148¼
8	.070	172	20	.171	160	32	.265	148
8¼	.072	171¾	20¼	.173	159¾	32¼	.267	147¾
8½	.074	171½	20½	.175	159½	32½	.269	147½
8¾	.076	171¼	20¾	.177	159¼	32¾	.270	147¼
9	.078	171	21	.179	159	33	.272	147
9¼	.080	170¾	21¼	.181	158¾	33¼	.274	146¾
9½	.083	170½	21½	.183	158½	33½	.276	146½
9¾	.085	170¼	21¾	.185	158¼	33¾	.278	146¼
10	.087	170	22	.187	158	34	.280	146
10¼	.089	169¾	22¼	.189	157¾	34¼	.281	145¾
10½	.091	169½	22½	.191	157½	34½	.283	145½
10¾	.093	169¼	22¾	.193	157¼	34¾	.285	145¼
11	.095	169	23	.195	157	35	.287	145
11¼	.098	168¾	23¼	.197	156¾	35¼	.289	144¾
11½	.100	168½	23½	.199	156½	35½	.290	144½
11¾	.102	168¼	23¾	.201	156¼	35¾	.292	144¼

¹ Acute angles are smaller than right angles.

² Obtuse angles are larger than right angles.

Table of natural half-sine values—Continued

Acute angles (degrees)	Value to use	Obtuse angles (degrees)	Acute angles (degrees)	Value to use	Obtuse angles (degrees)	Acute angles (degrees)	Value to use	Obtuse angles (degrees)
36	0.294	144	54	0.405	126	72	0.476	108
36 $\frac{1}{4}$	.296	143 $\frac{3}{4}$	54 $\frac{1}{4}$	.406	125 $\frac{3}{4}$	72 $\frac{1}{4}$	.476	107 $\frac{3}{4}$
36 $\frac{1}{2}$	.297	143 $\frac{1}{2}$	54 $\frac{1}{2}$	.407	125 $\frac{1}{2}$	72 $\frac{1}{2}$	.477	107 $\frac{1}{2}$
36 $\frac{3}{4}$	.299	143 $\frac{1}{4}$	54 $\frac{3}{4}$	.408	125 $\frac{1}{4}$	72 $\frac{3}{4}$	.478	107 $\frac{3}{4}$
37	.301	143	55	.410	125	73	.478	107
37 $\frac{1}{4}$	.303	142 $\frac{3}{4}$	55 $\frac{1}{4}$	.411	124 $\frac{3}{4}$	73 $\frac{1}{4}$	.479	106 $\frac{3}{4}$
37 $\frac{1}{2}$	.304	142 $\frac{1}{2}$	55 $\frac{1}{2}$	.412	124 $\frac{1}{2}$	73 $\frac{1}{2}$	.479	106 $\frac{1}{2}$
37 $\frac{3}{4}$	.306	142 $\frac{1}{4}$	55 $\frac{3}{4}$	.413	124 $\frac{1}{4}$	73 $\frac{3}{4}$	.480	106 $\frac{1}{4}$
38	.308	142	56	.415	124	74	.481	106
38 $\frac{1}{4}$	.301	141 $\frac{3}{4}$	56 $\frac{1}{4}$	.416	123 $\frac{3}{4}$	74 $\frac{1}{4}$	.481	105 $\frac{3}{4}$
38 $\frac{1}{2}$	.311	141 $\frac{1}{2}$	56 $\frac{1}{2}$	.417	123 $\frac{1}{2}$	74 $\frac{1}{2}$	.482	105 $\frac{1}{2}$
38 $\frac{3}{4}$	.313	141 $\frac{1}{4}$	56 $\frac{3}{4}$	.418	123 $\frac{1}{4}$	74 $\frac{3}{4}$	.482	105 $\frac{1}{4}$
39	.315	141	57	.419	123	75	.483	105
39 $\frac{1}{4}$	.316	140 $\frac{3}{4}$	57 $\frac{1}{4}$	.421	122 $\frac{3}{4}$	75 $\frac{1}{4}$	.484	104 $\frac{3}{4}$
39 $\frac{1}{2}$	.318	140 $\frac{1}{2}$	57 $\frac{1}{2}$	.422	122 $\frac{1}{2}$	75 $\frac{1}{2}$	.484	104 $\frac{1}{2}$
39 $\frac{3}{4}$	.320	140 $\frac{1}{4}$	57 $\frac{3}{4}$	.423	122 $\frac{1}{4}$	75 $\frac{3}{4}$	.485	104 $\frac{1}{4}$
40	.321	140	58	.424	122	76	.485	104
40 $\frac{1}{4}$	.323	139 $\frac{3}{4}$	58 $\frac{1}{4}$	.425	121 $\frac{3}{4}$	76 $\frac{1}{4}$	.486	103 $\frac{3}{4}$
40 $\frac{1}{2}$	.325	139 $\frac{1}{2}$	58 $\frac{1}{2}$	.426	121 $\frac{1}{2}$	76 $\frac{1}{2}$	.486	103 $\frac{1}{2}$
40 $\frac{3}{4}$	.326	139 $\frac{1}{4}$	58 $\frac{3}{4}$	.427	121 $\frac{1}{4}$	76 $\frac{3}{4}$	.487	103 $\frac{1}{4}$
41	.328	139	59	.429	121	77	.487	103
41 $\frac{1}{4}$	.330	138 $\frac{3}{4}$	59 $\frac{1}{4}$	.430	120 $\frac{3}{4}$	77 $\frac{1}{4}$	.488	102 $\frac{3}{4}$
41 $\frac{1}{2}$	.331	138 $\frac{1}{2}$	59 $\frac{1}{2}$	.431	120 $\frac{1}{2}$	77 $\frac{1}{2}$	.488	102 $\frac{1}{2}$
41 $\frac{3}{4}$	.333	138 $\frac{1}{4}$	59 $\frac{3}{4}$	.432	120 $\frac{1}{4}$	77 $\frac{3}{4}$	.489	102 $\frac{1}{4}$
42	.335	138	60	.433	120	78	.489	102
42 $\frac{1}{4}$	.336	137 $\frac{3}{4}$	60 $\frac{1}{4}$	.434	119 $\frac{3}{4}$	78 $\frac{1}{4}$	.490	101 $\frac{3}{4}$
42 $\frac{1}{2}$	.338	137 $\frac{1}{2}$	60 $\frac{1}{2}$	.435	119 $\frac{1}{2}$	78 $\frac{1}{2}$	.490	101 $\frac{1}{2}$
42 $\frac{3}{4}$	.339	137 $\frac{1}{4}$	60 $\frac{3}{4}$	.436	119 $\frac{1}{4}$	78 $\frac{3}{4}$	.490	101 $\frac{1}{4}$
43	.341	137	61	.437	119	79	.491	101
43 $\frac{1}{4}$	.343	136 $\frac{3}{4}$	61 $\frac{1}{4}$	.438	118 $\frac{3}{4}$	79 $\frac{1}{4}$	.491	100 $\frac{3}{4}$
43 $\frac{1}{2}$	.344	136 $\frac{1}{2}$	61 $\frac{1}{2}$	.439	118 $\frac{1}{2}$	79 $\frac{1}{2}$	.492	100 $\frac{1}{2}$
43 $\frac{3}{4}$	.346	136 $\frac{1}{4}$	61 $\frac{3}{4}$	.440	118 $\frac{1}{4}$	79 $\frac{3}{4}$	.492	100 $\frac{1}{4}$
44	.347	136	62	.441	118	80	.492	100
44 $\frac{1}{4}$	.349	135 $\frac{3}{4}$	62 $\frac{1}{4}$	.442	117 $\frac{3}{4}$	80 $\frac{1}{4}$	.493	99 $\frac{3}{4}$
44 $\frac{1}{2}$	.350	135 $\frac{1}{2}$	62 $\frac{1}{2}$	.444	117 $\frac{1}{2}$	80 $\frac{1}{2}$	.493	99 $\frac{1}{2}$
44 $\frac{3}{4}$	.352	135 $\frac{1}{4}$	62 $\frac{3}{4}$	.445	117 $\frac{1}{4}$	80 $\frac{3}{4}$	.494	99 $\frac{1}{4}$
45	.354	135	63	.446	117	81	.494	99
45 $\frac{1}{4}$	.355	134 $\frac{3}{4}$	63 $\frac{1}{4}$	.446	116 $\frac{3}{4}$	81 $\frac{1}{4}$	.494	98 $\frac{3}{4}$
45 $\frac{1}{2}$	.357	134 $\frac{1}{2}$	63 $\frac{1}{2}$	.447	116 $\frac{1}{2}$	81 $\frac{1}{2}$	.495	98 $\frac{1}{2}$
45 $\frac{3}{4}$	.358	134 $\frac{1}{4}$	63 $\frac{3}{4}$	.448	116 $\frac{1}{4}$	81 $\frac{3}{4}$	.495	98 $\frac{1}{4}$
46	.360	134	64	.449	116	82	.495	98
46 $\frac{1}{4}$	.361	134 $\frac{3}{4}$	64 $\frac{1}{4}$	.450	115 $\frac{3}{4}$	82 $\frac{1}{4}$	.495	97 $\frac{3}{4}$
46 $\frac{1}{2}$	.363	133 $\frac{1}{2}$	64 $\frac{1}{2}$	.451	115 $\frac{1}{2}$	82 $\frac{1}{2}$	.496	97 $\frac{1}{2}$
46 $\frac{3}{4}$	.364	133 $\frac{1}{4}$	64 $\frac{3}{4}$	.452	115 $\frac{1}{4}$	82 $\frac{3}{4}$	.496	97 $\frac{1}{4}$
47	.366	133	65	.453	115	83	.496	97
47 $\frac{1}{4}$	.367	132 $\frac{3}{4}$	65 $\frac{1}{4}$	.454	114 $\frac{3}{4}$	83 $\frac{1}{4}$	.497	96 $\frac{3}{4}$
47 $\frac{1}{2}$	.369	132 $\frac{1}{2}$	65 $\frac{1}{2}$	.455	114 $\frac{1}{2}$	83 $\frac{1}{2}$	.497	96 $\frac{1}{2}$
47 $\frac{3}{4}$	.370	132 $\frac{1}{4}$	65 $\frac{3}{4}$	.456	114 $\frac{1}{4}$	83 $\frac{3}{4}$	.497	96 $\frac{1}{4}$
48	.372	132	66	.457	114	84	.497	96
48 $\frac{1}{4}$	.373	131 $\frac{3}{4}$	66 $\frac{1}{4}$	.458	113 $\frac{3}{4}$	84 $\frac{1}{4}$	.497	95 $\frac{3}{4}$
48 $\frac{1}{2}$	.374	131 $\frac{1}{2}$	66 $\frac{1}{2}$	.459	113 $\frac{1}{2}$	84 $\frac{1}{2}$	.498	95 $\frac{1}{2}$
48 $\frac{3}{4}$	.376	131 $\frac{1}{4}$	66 $\frac{3}{4}$	.459	113 $\frac{1}{4}$	84 $\frac{3}{4}$	.498	95 $\frac{1}{4}$
49	.377	131	67	.460	113	85	.498	95
49 $\frac{1}{4}$	.379	130 $\frac{3}{4}$	67 $\frac{1}{4}$	.461	112 $\frac{3}{4}$	85 $\frac{1}{4}$	.498	94 $\frac{3}{4}$
49 $\frac{1}{2}$	.380	130 $\frac{1}{2}$	67 $\frac{1}{2}$	.462	112 $\frac{1}{2}$	85 $\frac{1}{2}$	.498	94 $\frac{1}{2}$
49 $\frac{3}{4}$	.382	130 $\frac{1}{4}$	67 $\frac{3}{4}$	.463	112 $\frac{1}{4}$	85 $\frac{3}{4}$	.499	94 $\frac{1}{4}$
50	.383	130	68	.464	112	86	.499	94
50 $\frac{1}{4}$	.384	129 $\frac{3}{4}$	68 $\frac{1}{4}$	.464	111 $\frac{3}{4}$	86 $\frac{1}{4}$	.499	93 $\frac{3}{4}$
50 $\frac{1}{2}$	.386	129 $\frac{1}{2}$	68 $\frac{1}{2}$	.465	111 $\frac{1}{2}$	86 $\frac{1}{2}$	.499	93 $\frac{1}{2}$
50 $\frac{3}{4}$	.387	129 $\frac{1}{4}$	68 $\frac{3}{4}$	.466	111 $\frac{1}{4}$	86 $\frac{3}{4}$	.499	93 $\frac{1}{4}$
51	.389	129	69	.467	111	87	.499	93
51 $\frac{1}{4}$	.390	128 $\frac{3}{4}$	69 $\frac{1}{4}$	.468	110 $\frac{3}{4}$	87 $\frac{1}{4}$	.499	92 $\frac{3}{4}$
51 $\frac{1}{2}$	.391	128 $\frac{1}{2}$	69 $\frac{1}{2}$	.468	110 $\frac{1}{2}$	87 $\frac{1}{2}$	.500	92 $\frac{1}{2}$
51 $\frac{3}{4}$	.393	128 $\frac{1}{4}$	69 $\frac{3}{4}$	.469	110 $\frac{1}{4}$	87 $\frac{3}{4}$	.500	92 $\frac{1}{4}$
52	.394	128	70	.470	110	88	.500	92
52 $\frac{1}{4}$	.395	127 $\frac{3}{4}$	70 $\frac{1}{4}$	.471	109 $\frac{3}{4}$	88 $\frac{1}{4}$	.500	91 $\frac{3}{4}$
52 $\frac{1}{2}$	.397	127 $\frac{1}{2}$	70 $\frac{1}{2}$	.471	109 $\frac{1}{2}$	88 $\frac{1}{2}$	.500	91 $\frac{1}{2}$
52 $\frac{3}{4}$	.398	127 $\frac{1}{4}$	70 $\frac{3}{4}$	.472	109 $\frac{1}{4}$	88 $\frac{3}{4}$	.500	91 $\frac{1}{4}$
53	.399	127	71	.473	109	89	.500	91
53 $\frac{1}{4}$	.401	126 $\frac{3}{4}$	71 $\frac{1}{4}$	.473	108 $\frac{3}{4}$	89 $\frac{1}{4}$	.500	90 $\frac{3}{4}$
53 $\frac{1}{2}$	.402	126 $\frac{1}{2}$	71 $\frac{1}{2}$	.474	108 $\frac{1}{2}$	89 $\frac{1}{2}$	.500	90 $\frac{1}{2}$
53 $\frac{3}{4}$	.403	126 $\frac{1}{4}$	71 $\frac{3}{4}$	.475	108 $\frac{1}{4}$	89 $\frac{3}{4}$	.500	90 $\frac{1}{4}$
						90	.500	90

APPENDIX 16

CONVERSION TABLE.—ACRES TO SQUARE FEET

Acres	Square feet	Acres	Square feet	Acres	Square feet	Acres	Square feet
1	43, 560	76	3, 310, 560	151	6, 577, 560	226	9, 844, 560
2	87, 120	77	3, 354, 120	152	6, 621, 120	227	9, 888, 120
3	130, 680	78	3, 397, 680	153	6, 664, 680	228	9, 931, 680
4	174, 240	79	3, 441, 240	154	6, 708, 240	229	9, 975, 240
5	217, 800	80	3, 484, 800	155	6, 751, 800	230	10, 018, 800
6	261, 360	81	3, 528, 360	156	6, 795, 360	231	10, 062, 360
7	304, 920	82	3, 571, 920	157	6, 838, 920	232	10, 105, 920
8	348, 480	83	3, 615, 480	158	6, 882, 480	233	10, 149, 480
9	392, 040	84	3, 659, 040	159	6, 926, 040	234	10, 193, 040
10	435, 600	85	3, 702, 600	160	6, 969, 600	235	10, 236, 600
11	479, 160	86	3, 746, 160	161	7, 013, 160	236	10, 280, 160
12	522, 720	87	3, 789, 720	162	7, 056, 720	237	10, 323, 720
13	566, 280	88	3, 833, 280	163	7, 100, 280	238	10, 367, 280
14	609, 840	89	3, 876, 840	164	7, 143, 840	239	10, 410, 840
15	653, 400	90	3, 920, 400	165	7, 187, 400	240	10, 454, 400
16	696, 960	91	3, 963, 960	166	7, 230, 960	241	10, 497, 960
17	740, 520	92	4, 007, 520	167	7, 274, 520	242	10, 541, 520
18	784, 080	93	4, 051, 080	168	7, 318, 080	243	10, 585, 080
19	827, 640	94	4, 094, 640	169	7, 361, 640	244	10, 628, 640
20	871, 200	95	4, 138, 200	170	7, 405, 200	245	10, 672, 200
21	914, 760	96	4, 181, 760	171	7, 448, 760	246	10, 715, 760
22	958, 320	97	4, 225, 320	172	7, 492, 320	247	10, 759, 320
23	1, 001, 880	98	4, 268, 880	173	7, 535, 880	248	10, 802, 880
24	1, 045, 440	99	4, 312, 440	174	7, 579, 440	249	10, 846, 440
25	1, 089, 000	100	4, 356, 000	175	7, 623, 000	250	10, 890, 000
26	1, 132, 560	101	4, 399, 560	176	7, 666, 560	251	10, 933, 560
27	1, 176, 120	102	4, 443, 120	177	7, 710, 120	252	10, 977, 120
28	1, 219, 680	103	4, 486, 680	178	7, 753, 680	253	11, 020, 680
29	1, 263, 240	104	4, 530, 240	179	7, 797, 240	254	11, 064, 240
30	1, 306, 800	105	4, 573, 800	180	7, 840, 800	255	11, 107, 800
31	1, 350, 360	106	4, 617, 360	181	7, 884, 360	256	11, 151, 360
32	1, 393, 920	107	4, 660, 920	182	7, 927, 920	257	11, 194, 920
33	1, 437, 480	108	4, 704, 480	183	7, 971, 480	258	11, 238, 480
34	1, 481, 040	109	4, 748, 040	184	8, 015, 040	259	11, 282, 040
35	1, 524, 600	110	4, 791, 600	185	8, 058, 600	260	11, 325, 600
36	1, 568, 160	111	4, 835, 160	186	8, 102, 160	261	11, 369, 160
37	1, 611, 720	112	4, 878, 720	187	8, 145, 720	262	11, 412, 720
38	1, 655, 280	113	4, 922, 280	188	8, 189, 280	263	11, 456, 280
39	1, 698, 840	114	4, 965, 840	189	8, 232, 840	264	11, 499, 840
40	1, 742, 400	115	5, 009, 400	190	8, 276, 400	265	11, 543, 400
41	1, 785, 960	116	5, 052, 960	191	8, 319, 960	266	11, 586, 960
42	1, 829, 520	117	5, 096, 520	192	8, 363, 520	267	11, 630, 520
43	1, 873, 080	118	5, 140, 080	193	8, 407, 080	268	11, 674, 080
44	1, 916, 640	119	5, 183, 640	194	8, 450, 640	269	11, 717, 640
45	1, 960, 200	120	5, 227, 200	195	8, 494, 200	270	11, 761, 200
46	2, 003, 760	121	5, 270, 760	196	8, 537, 760	271	11, 804, 760
47	2, 047, 320	122	5, 314, 320	197	8, 581, 320	272	11, 848, 320
48	2, 090, 880	123	5, 357, 880	198	8, 624, 880	273	11, 891, 880
49	2, 134, 440	124	5, 401, 440	199	8, 668, 440	274	11, 935, 440
50	2, 178, 000	125	5, 445, 000	200	8, 712, 000	275	11, 979, 000
51	2, 221, 560	126	5, 488, 560	201	8, 755, 560	276	12, 022, 560
52	2, 265, 120	127	5, 532, 120	202	8, 799, 120	277	12, 066, 120
53	2, 308, 680	128	5, 575, 680	203	8, 842, 680	278	12, 109, 680
54	2, 352, 240	129	5, 619, 240	204	8, 886, 240	279	12, 153, 240
55	2, 395, 800	130	5, 662, 800	205	8, 929, 800	280	12, 196, 800
56	2, 439, 360	131	5, 706, 360	206	8, 973, 360	281	12, 240, 360
57	2, 482, 920	132	5, 749, 920	207	9, 016, 920	282	12, 283, 920
58	2, 526, 480	133	5, 793, 480	208	9, 060, 480	283	12, 327, 480
59	2, 570, 040	134	5, 837, 040	209	9, 104, 040	284	12, 371, 040
60	2, 613, 600	135	5, 880, 600	210	9, 147, 600	285	12, 414, 600
61	2, 657, 160	136	5, 924, 160	211	9, 191, 160	286	12, 458, 160
62	2, 700, 720	137	5, 967, 720	212	9, 234, 720	287	12, 501, 720
63	2, 744, 280	138	6, 011, 280	213	9, 278, 280	288	12, 545, 280
64	2, 787, 840	139	6, 054, 840	214	9, 321, 840	289	12, 588, 840
65	2, 831, 400	140	6, 098, 400	215	9, 365, 400	290	12, 632, 400
66	2, 874, 960	141	6, 141, 960	216	9, 408, 960	291	12, 675, 960
67	2, 918, 520	142	6, 185, 520	217	9, 452, 520	292	12, 719, 520
68	2, 962, 080	143	6, 229, 080	218	9, 496, 080	293	12, 763, 080
69	3, 005, 640	144	6, 272, 640	219	9, 539, 640	294	12, 806, 640
70	3, 049, 200	145	6, 316, 200	220	9, 583, 200	295	12, 850, 200
71	3, 092, 760	146	6, 359, 760	221	9, 626, 760	296	12, 893, 760
72	3, 136, 320	147	6, 403, 320	222	9, 670, 320	297	12, 937, 320
73	3, 179, 880	148	6, 446, 880	223	9, 713, 880	298	12, 980, 880
74	3, 223, 440	149	6, 490, 440	224	9, 757, 440	299	13, 024, 440
75	3, 267, 000	150	6, 534, 000	225	9, 801, 000	300	13, 068, 000

CONVERSION TABLE.—ACRES TO SQUARE FEET—Continued

10ths of acres	Square feet	10ths of acres	Square feet	10ths of acres	Square feet
0.1-----	4,356	0.4-----	17,424	0.7-----	30,492
.2-----	8,712	.5-----	21,780	.8-----	34,848
.3-----	13,068	.6-----	26,136	.9-----	39,204

CONVERSION TABLE.—SQUARE FEET TO ACRES

Square feet	Acres	Square feet	Acres	Square feet	Acres	Square feet	Acres
10,000-----	0.22957	33,000-----	0.75757	56,000-----	1.28558	79,000-----	1.81359
11,000-----	.25252	34,000-----	.78053	57,000-----	1.30854	80,000-----	1.83655
12,000-----	.27548	35,000-----	.80349	58,000-----	1.33150	81,000-----	1.85950
13,000-----	.29844	36,000-----	.82645	59,000-----	1.35445	82,000-----	1.88246
14,000-----	.32139	37,000-----	.84940	60,000-----	1.37741	83,000-----	1.90542
15,000-----	.34435	38,000-----	.87236	61,000-----	1.40037	84,000-----	1.92837
16,000-----	.36731	39,000-----	.89532	62,000-----	1.42332	85,000-----	1.95133
17,000-----	.39027	40,000-----	.91827	63,000-----	1.44628	86,000-----	1.97429
18,000-----	.41322	41,000-----	.94123	64,000-----	1.46924	87,000-----	1.99724
19,000-----	.43618	42,000-----	.96419	65,000-----	1.49219	88,000-----	2.02020
20,000-----	.45914	43,000-----	.98714	66,000-----	1.51515	89,000-----	2.04316
21,000-----	.48209	44,000-----	1.01010	67,000-----	1.53811	90,000-----	2.06611
22,000-----	.50505	45,000-----	1.03306	68,000-----	1.56106	91,000-----	2.08907
23,000-----	.52801	46,000-----	1.05601	69,000-----	1.58402	92,000-----	2.11203
24,000-----	.55096	47,000-----	1.07897	70,000-----	1.60698	93,000-----	2.13499
25,000-----	.57392	48,000-----	1.10193	71,000-----	1.62993	94,000-----	2.15794
26,000-----	.59688	49,000-----	1.12488	72,000-----	1.65289	95,000-----	2.18090
27,000-----	.61983	50,000-----	1.14784	73,000-----	1.67585	96,000-----	2.20386
28,000-----	.64279	51,000-----	1.17080	74,000-----	1.69881	97,000-----	2.22681
29,000-----	.66575	52,000-----	1.19375	75,000-----	1.72176	98,000-----	2.24977
30,000-----	.68870	53,000-----	1.21671	76,000-----	1.74472	99,000-----	2.27273
31,000-----	.71166	54,000-----	1.23967	77,000-----	1.76768	100,000-----	2.29568
32,000-----	.73462	55,000-----	1.26263	78,000-----	1.79063		

This conversion table for converting square feet to acres will be found of considerable value. If properly used, areas in square feet may be converted to hundredths of acres.

Example: The area is 3,451,890 square feet—what is the area in acres?

First, consider 3,400,000 the table shows that 34,000 square feet is 0.78053. 34,000 is a five-place figure and 3,400,000 has seven places, therefore, move the decimal place two places to the right in the acreage figure. Then, 3,400,000 square feet becomes 78.053 acres. There is left 51,890 square feet after subtracting the 3,400,000 square feet. The table shows 51,000 square feet to be 1.1708 acres and the 890 square feet remaining is 0.0243 acres.

The complete solution then is:

	Acres
3,400,000 square feet is-----	78.053
51,000 square feet is-----	1.171
890 square feet is-----	.020
3,451,890 square feet is-----	79.244

TENTATIVE ORGANIZATION CHART SHOWING ONE STATE UNIT

